THE

CYCLOPÆDIA;

or,

Universal Dictionary

of

ARTS, SCIENCES, AND LITERATURE.

VOL. XXIX.
THE

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OR,

UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY


WITH THE ASSISTANCE OF

EMINENT PROFESSIONAL GENTLEMEN.

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BY THE MOST DISTINGUISHED ARTISTS.

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PUNISHMENT, a penalty imposed upon the commission of some crime or offence against the laws. It is essential to the nature of a law, that it import or declare a punishment to the transgressors of it.

Solon very justly asserted, that the two great stimulants of human action being hope and fear, a good government could not possibly exist without an equitable system of rewards and punishments.

The forms and manners of punishment are various in various countries and ages, and for various crimes; as treason, felony, adultery, parricide, &c.

There was a time, says Beccaria, when all punishments were pecuniary. The crimes of the subjects were the inheritance of the prince, so that an injury done to society was a favour to the crown, and the sovereign and magistrates, those guardians of the public security, were interested in the violation of the laws. Crimes were tried at that time in a court of exchequer, and the cause became a civil suit between the person accused and the crown. The magistrate then possessed powers that were not necessary for the public welfare, and the criminal suffered punishments different from those which the necessity of example required. The judge was rather a collector for the crown, an agent for the treasury, than a protector and minister of the laws.

Among the Romans, the pecuniary punishments were the mala est et conciatio. The corporal punishments were capitis diminutio, aque et igni interdictio, proscriptio, deportatio, relegatio, surca, crux, carcer, culeus, equidus, scula, gemonis, damnatio ad gladium, ad metallum, flagellation, talio, &c. which see described under their respective articles.

Among us the principal civil punishments are, fines, imprisonments, the flocks, pillory, burning in the hand, scotting, ducking, hanging, beheading, quartering, burning, transportation, &c.

The ecclesiastical punishments are, censures, suspensions, deprivation, degradations, excommunications, anathemas, penances, &c. The military punishments are, being shot, running the gantlet, riding the wooden horse, the bilboes, &c.

Among the Turks, &c. impaling, bastinadoes on the soles of the feet, &c. obtain. See Empalement, &c.

The right of punishing crimes against the law of nature, as murder and the like, is in a state of mere nature vested in every individual. Accordingly the first murderer, Cain, was so sensible of this, that we perceive him (Gen. iv. 14.) expressing his apprehensions, that whoever would find him would slay him. In a state of society, this right is transferred from individuals to the sovereign power; and thus men are prevented from being judges in their own causes, which is one of the evils that civil government was intended to remedy. The sword of justice is now vested by the consent of the whole community in the magistrate alone. Every punishment which does not arise from absolute necessity, says the great Montesquieu, is tyrannical; and this proposition is rendered more general by Beccaria, who observes, that every act of authority of one man over another, for which there is not an absolute necessity, is tyrannical.

Upon this principle, the sovereign's right to punish crimes is founded; that is, upon the necessity of defending the public liberty, entrusted to his care, from the usurpation of individuals; and punishments are just in proportion, as the liberty, preferred by the sovereign, is sacred and valuable. It was necessity that forced men to give up a part of their liberty, and it is certain, that every individual would choose to put into the public stock the smallest portion possible; as much only as was sufficient to engage others to defend it. The aggregate of these, the smallest portions possible, forms the right of punishing: all that extends beyond this is abuse, and not justice. The laws only can determine the
the punishment of crimes; and the authority of making penal laws can only reside with the legislator, who represents the whole society, united by the social compact. No magistrate, therefore, as he is one of the society, can, with justice, inflict on any other member of the same society, punishment that is not ordained by the laws, nor increase the punishment already determined by the laws. To the sovereign representing the society itself, who makes general laws to bind the members, it does not belong to judge, whether any individual has violated the social compact, or incurred the consequent punishment. In this case, there are two parties, one represented by the sovereign, who inflicts upon the violation of the contract, and the other is the person accused, who denies it. It is necessary then, that there should be a third person to decide this contest; that is to say, a judge or magistrate, from whose determination there should be no appeal. Judges, in criminal causes, says Baccarini, have no right to interpret the penal laws, because they are not legislators. The lawful interpreter is the sovereign, that is, the representative of society, and not the judge, whose office is only to examine, if a man have, or have not committed an action contrary to the laws. Many evils arise from the erring infallibility of arbitrary interpretation.

The lawgivers of punishing criminals, who are chargeable with offences against the laws of society, that are only "mala prohibita," and not "mala in se," is founded upon this principle, that the law by which they suffer was made by their own consent; it is a part of the original compact into which they entered, when first they engaged in society; it was calculated for, and has long contributed to their own security. This right, conferred by universal consent, gives to the state exactly the same power, and no more, over all its members, as each individual member had naturally over himself or others. Hence some have doubted how far a human legislature ought to inflict capital punishments for "pоборные offences;"—offences against the municipal law only, not against the law of nature; since no individual has, naturally, a power of inflicting death upon himself or others for actions in themselves indifferent.

With regard to offences "mala in se," capital punishments are in some instances inflicted by the immediate command of God himself to all mankind, as in the case of murder, by the precept delivered to Noah, their common ancestor and representative (Gen. xvi.), "whoso sheddeth man's blood, by man shall his blood be shed." In other instances they are inflicted after the example of the Creator, in his positive code of laws for the regulation of the Jewish republic, as the case of the crime against nature. But they are sometimes inflicted without such express warrant or example, at the will and discretion of the human legislature, as for forgery, for theft, and sometimes for offences of a lighter kind. None of these crimes are offences against natural, but only against social, rights. The practice of inflicting capital punishments, for offences of human institution, is thus justified by that great and good man, sir Matthew Hale (1 Hal. P. C. 13.) "When offences grow enormous, frequent, and dangerous to a kingdom or state, destructive or highly pernicious to civil societies, and to the great insecurity and danger of the kingdom or its inhabitants, severe punishment and even death itself is necessary to be annexed to laws in many cases by the prudence of lawsgivers." It is, therefore, as judge Blackstone observes, the enormity, or dangerous tendency of the crime, that alone can warrant any earthly legislature in putting him to death that commits it. It is not its frequency only, or the difficulty of otherwise preventing it, that will excuse our attempting to prevent it by a wanton effusion of human blood. For, though the end of punishment is to deter men from offending, it can never follow from this circumstance, that it is lawful to deter them at any rate and by any means; since there may be unlawful methods of enforcing obedience even to the justest laws. Every humane legislator, as the learned judge remarks, will be therefore extremely cautious of establishing laws that inflict the penalty of death, especially for flight offences, or such as are merely positive. Nor will it avail to allege that no lighter penalty will be effectual, because experience has not taught us that capital punishments are more effectual. Was the vast territory of all the Russias, it may be asked, worse regulated under the empress Elizabeth, than under her more fanguinary predecessors? Or has it been since, under Catherine II., less civilized, less social, and less secure? And yet we are assured, that neither of these illustrious princesses have, throughout their whole administration, inflicted the penalty of death; and the latter, upon full persuasion of its being useless, and even pernicious, issued orders for abolishing it entirely throughout her extensive dominions. But if capital punishments, says Blackstone, were proved by experience to be a sure and effectual remedy, that would not prove the necessity (upon which the justice and propriety depend) of inflicting them upon all occasions, when other expediency fail. This reasoning would, as we may justly apprehend, extend much too far. Were the evil to be prevented is not adequate to the evil itself, the preventive, a sovereign that thinks seriously can never reconcile laws that inflict death to the dictates of conscience and humanity. To shed the blood of our fellow-creature, says the learned and humane judge, is a matter that requires the greatest deliberation, and the fullest conviction of our own authority; for life is the immediate gift of God to man; which neither he can resign, nor can it be taken from him, unlefs by the command or permission of him who gave it; either expressly revealed or collected from the laws of nature or society by clear and indisputable demonstration. Blackstone, however, would not be underfoot to deny the right of the legislature in any country to enforce its own laws by the death of the transgressor, though some persons of abilities have doubted it. To this class of persons we may refer the ingenious writer already cited. The ulelefs profusion of punishments, which has never made man better, has induced Baccarini to enquire, whether the punishment of death be really just or useful in a well-governed state? What right, he asks, have men to cut the throats of their fellow-creatures? Certainly not that on which the sovereignty and laws are founded. The laws are only the sum of the settled portions of the private liberty of each individual, and represent the general will, which is the aggregate of that of each individual. Did any one ever give to others the right of taking away his life? Is it possible, that in the smallest portions of the liberty of each, sacrificed to the good of the public, can be contained the greatest of all good, life? If it were so, how shall it be reconciled to the maxim which tells us, that a man has no right to kill himself? Which he certainly must have, if he could give it away to another. The punishment of death is not authorized by any right; for no such right exists. The death of a citizen cannot be necessary, but in one case; when, though deprived of his liberty, he has such power and connections as may endanger the security of the nation; when his existence may produce a dangerous revolution in the established form of government. But even in this case, it can only be necessary when a nation is on the verge of recovering or losing its liberty; or in times of absolute anarchy, when the disorders themselves hold the place of laws.

If the experience of all ages be not sufficient to prove, that the punishment of death has never prevented determined men
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men from injuring society; if the example of the Romans; if twenty years reign of Elizabeth, empress of Ruffia, in which she gave the fathers of their country an example more illustrious than many conquests bought with blood; if, says Beccaria, all this be not sufficient to persuade mankind, who always suspeét the voice of reason, and who choose rather to be led by authority, let us confult human nature in proof of this asserfion.

It is not the intenfeness of the pain that has the greaftest effect on the mind, but its continuance; for our fenfibility is more easily and more powerfully affected by weak but repeated impreffions, than by a violent, but momentary, impulse. The power of habit is universal over every fenfible being. As it is by that we learn to fpeak, to walk, and to fatisfy our neceffities, fo the ideas of morality are stamped on our minds by repeated impreffions. The death of a criminal is a terrible but momentary fpectacle, and therefore a lefs efficacious method of deterring others, than the continued example of a man deprived of his liberty, condemned, as a beafl of burthen, to repair, by his labour, the injury he has done to fociety. "If I commit such a crime," fays the Spectator to himfelf, "I shall be reduced to that miserable condition for the rest of my life." A much more powerful preventive than the fear of death, which men always behold in diftant obfcurity.

The terrors of death make fo flight an impreffion, that it has not force enough to withfand the forgetfulness natural to mankind, even in the moft effential things; especially when affifted by the passions. Violent impreffions surprife us, but their effect is momentary; they are fitted to produce those revolutions which infantly transform a common man into a Lacedemonian or a Perifian; but in a free and quiet government they ought to be rather frequent than ftrong.

The execution of a criminal is, to the multitude, a fpectacle, which in fome excites compaffion mixed with indignation. Thofe fenfiments occupy the mind much more than that fubtle terror which the laws endeavour to infpire; but in the contemplation of continued fuffering, terror is the only, or at leaft predominant fenfation. The severity of a pulfishment should be juft fufficient to excite compaffion in the fpectators, as it is intended more for them than for the criminal.

A pulfishment, to be fir, should have only that degree of severity which is fufficient to deter others. Now there is no man, who, upon the leaft reflation, would put in competition the total and perpetual lofs of his liberty, with the greaftest advantages he could possibly obtain in confequence of a crime. Perpetual flavery, then, has in it all that is neceffary to deter the moft hardened and determined, as much as the pulfishment of death: it has even more. There are many who can look upon death with intrepidity and firmness; fome through fanfaticism, and others through vanity, which attends us even to the grave; others from a desperate reolution, either to get rid of their mifery, or ceafe to live; but fanfaticism and vanity forfake the criminal in flavery, in obfains and fetters, in an iron cage; and defpair seems rather the beginning than the end of their mifery. The mind, by collecting itfelf and uniting all its force, can, for a moment, repel affailing grief; but its moft vigorous efforts are insufficient to repel perpetual wretchedness.

In all actions, where death is used as a pulfishment, every example furnophes a new crime committed. Whereas in perpetual flavery, every criminal affords a frequent and lafting example; and if it be neceffary that men fhould often be witnefles of the power of the laws, criminals fhould often be put to death; but this furnophes a frequency of crimes; and from hence this pulfishment will ceafe to have its effect, fo that it muft be ufeful and ufelefs at the fame time.

We fhall be told, that perpetual flavery is as painful a pulfishment as death, and therefore as cruel. To which we ansver, that if all the miferable moments in the life of a flav were collected into one point, it would be a more cruel pulfishment than any other; but these are scattered through his whole life, whilst the pain of death exerts all its force in a moment. There is also another advantage in the pulfishment of flavery, which is, that it is more terrible to the fpectator than to the sufferer himfelf; for the fpectator coniders the sum of all his wretched moments, whilst the sufferer, by the mifery of the prefent, is prevented from thinking of the future. All evils are increafed by the ima- gination, and the sufferer finds refoures and confolations, of which the fpectators are ignorant; who judge by their own fenfibility of what paffes in a mind, by habit grown callous to misfortune.

He who forefces that he muft pafs a great number of years, even his whole life, in pain and flavery; a flav to thofe laws by which he was protected; in flight of his fellow citizens, with whom he lives in freedom and fociety; makes an ufeful comparison between thofe evils, the uncertainty of his fuc- cefs, and the fhortnefs of the time in which he fhall enjoy the fruits of his tranfgreffion. The example of thofe wretches continually before his eyes, makes a much greater impreffion on him than a pulfishment, which, instead of correcting, makes him more obdurate.

The pulfishment of death is pennisious to fociety, from the example of barbarity it affords. If the passions, or the neceffity of war, have taught men to fhed the blood of their fellow creatures, the laws, which are intended to moderate the ferociaty of mankind, fhould not increafe it by examples of barbarity, the more horrible, as this pulfishment is usually attended with formal pageantry. Is it not abfurd, that the laws, which deteft and punifh homicide, fhould, in order to prevent murder, publicly commit murder themfelves? What are the true and moft ufeful laws? Thofe compacts and conditions which all would promife and obferve, in thofe moments when private interefte is silent, or combined with that of the public. What are the natural fenfiments of every perfon concerning the pulfishment of death? We may read them in the contempt and indignation with which every one looks on the executioner, who is neceffarily an innocent executor of the public will; a good citizen, who contributes to the ad- vantage of fociety; the instrument of the general fecurity without which as good fathers are without. What then is the origin of this contradiction? Why is this fenfiment of mankind indelible, to the scandal of reflation? It is, that in a fecret corner of the mind, in which the original impreffions of na- ture are ftrill preferved, men difcover a fenfiment which tellis them, that their lives are not lawfully in the power of any one, but of that necelfity only, which with its iron fceptre rules the univerfe.

What muft men think, when they fee wife magiftrates and grave muniflers of justice, with indifference and tranquillity, dragging a criminal to death, and while a wretch trembles with agony, expeeting the fatal stroke, the judge, who has condemned him, with the coldeft indefinition, and perhaps with no small gratifcation from the exertion of his authority, quits his tribunal to enjoy the comforts and pleasures of life? They will fay, 'Ah! thofe cruel formalities of justice are a cloak to tyranny, they are a fecret language, a folemn veil, intended to conceal the word by which we are sacrififed to the infatiable idol of deportifm. Murder, which they would repreff to us as an horrible crime, we fee practifed by them without repugnance, or renounce. Let us follow their ex- ample.
The punishment of crimes of violence must be left to the arbitration of the legislature, which should inflict such penalties as are warranted by the laws of nature and society, and such as appear to be the best calculated to answer the end of precaution against future offences. Some have recommended, and highly extolled for its equity, the "lex talionis," or law of retaliation; but judge Blackstone observes, that this can never be in all cases an adequate or permanent rule of judgment. Although there cannot be any regular or determinate method of rating the quantity of punishments for crimes, by any one uniform rule, applicable to all cases, and without ultimately referring to the will and discretion of the legislative power; yet there are some general principles, deduced from the nature and circumstances of the crime, that may afford some assistance in allotting to it an adequate punishment. One circumstance that serves in some measure to determine the nature and degree of punishment regards the object of it; for the more dignified in respect of rank, character, and influence, the object of an injury is, so much greater care should be taken to prevent that injury, and of course under this aggravation the punishment should be more severe. Accordingly treason in confining the king's death, is by the English law punished with greater rigour than even actually killing any private subject. Moreover, the violence of passion, or temptation may, in some cases, alleviate a crime; such is theft in case of hunger, contradicting with the fame crime committed through avarice, and to serve the purposes of luxury. Homicide, in consequence of sudden and violent resentment, is less penal than upon cool deliberate malice. The age, education, and character of the offender; the repetition (or otherwise) of the offence; the time, the place, the company in which it was committed: all these, and a thousand other incidents, may aggravate or extenuate the crime. Thus Demofthenes (in his oration against Midas) truly remarks the aggravations of the insults he had received: "I was abused," says he, "by my enemy, in cold blood, out of malice, not by heat of wine, in the morning, publicly, before strangers as well as citizens; and that in the temple, whither the duty of my office called me."

Farther, as punishments are chiefly intended for the prevention of future crimes, those should be most severely punished, which are the most destructive of the public safety and happiness; and, among crimes of an equal malignity, those which a man has the most frequent and easy opportunity of committing, which cannot be so easily guarded against as others, and which, therefore, the offender has the strongest inducement to commit; according to Cicero's observation (Pro Sexto Roscio, 46): "et sunt animadvertenda peccata maxima, qua difficillimum praecavendum."

We may also observe, that punishments of unreasonable severity, especially when indiscriminately inflicted, have least effect in preventing crimes, and amending the manners of a people, as such as are more mild or merciful in general, and yet properly intermixed with due distinctions of severity. Crimes, says Beccaria, are more effectually prevented by the certainty than the severity of punishment. The certainty of a small punishment will make a stronger impression, than the fear of one more severe, if attended with the hopes of escaping: for it is the nature of mankind to be terrified at the approach of the smallest inevitable evil, whilst hope, the best gift of heaven, hath the power of dispelling the apprehension of a greater; especially if supported by examples of impunity, which weakens or avarice too frequently afford.

If punishments be very severe, men are naturally led to the perpetration of other crimes, to avoid the punishment due to the first. The countries and times most notorious for severity of punishments, were always those in which the most bloody and inhuman actions and the most atrocious crimes were committed; for the hand of the legislator and the alarum were directed by the same spirit of ferocity; which, on the throne, dictated laws of iron to slaves and savages, and, in private, infligted the subject to sacrifice one tyrant to make room for another.

In proportion as punishments become more cruel, the minds of men, as a fluid rises to the fame height with that which surrounds it, grow hardened and insensible; and the force of the passions still continuing, in the space of an hundred years, the wheel terrifies no more than formerly the prizon. That a punishment may produce the effect required,
it is sufficient that the evil it occasions should exceed the good expected from the crime; including in the calculation the certainty of the punishment, and the privation of the expected advantage. All severity beyond this is superfluous, and therefore tyrannical.

There are yet two other consequences of cruel punishments, which counteract the purpose of their institution, which was, to prevent crimes. The first arises from the impossibility of establishing an exact proportion between the crime and punishment, for though ingenious cruelty hath greatly multiplied the variety of torments, yet the human frame can suffer only to a certain degree, beyond which it is impossible to proceed, be the enormity of the crime. The second consequence is impunity. Human nature is limited no less in evil than in good. Excessive barbarity can never be more than temporary; it being impossible that it should be supported by a permanent system of legislation; for if the laws be too cruel they must be altered, or anarchy and impunity will succeed. The excessive severity of laws (says Montesquieu, Sp. of Laws, b. 6. c. 13,) hinders their execution; when the punishment far exceeds all measure, the public will frequently, out of humanity, prefer impunity to it.

Thus also the statute 1 Mar. ft. c. 1. recites in its preamble, "that the state of every king confuits more assuredly in the love of the subject towards his prince, than in the dread of laws made with rigorous pains; and that laws made for the preservation of the commonwealth without great penalties, are more often obeyed and kept than laws made with extreme punishments." Happy had it been for the nation, says Judge Blackstone, if the subsequent practice of that deluded prince, in matters of religion, had been correspondent to these sentiments of her self and parliament, in matters of state and government. It may be farther observed, that fanguinary laws are a bad symptom of the distemper of any state, or at least of its weak constitution. The laws of the Roman kings, and the twelve tables of the decemvirs, were full of cruel punishments: the Porcian law, which exempted all citizens from sentence of death, silently abrogated them all. At this period the republic flourished: under the emperors severe punishments were revived; and then the empire fell.

We may further add, that it is absurd and impolitic to apply the same punishment to crimes of different malignity. Besides, a multitude of fanguinary laws (besides the doubt that may be entertained concerning the right of making them,) fungs likewise a manifest defect either in the wisdom of the legislative, or the strength of the executive power. Although it be much easier to extirpate than to amend mankind; yet that magistrate must be esteemed both a weak and a cruel surgeon, who cuts off every limb, which through ignorance or indolence he will not attempt to cure. Boccaccio therefore proposes to form in every state a scale of crimes, with a corresponding scale of punishments, depending from the greatest to the least, but if this idea be deemed romantic, a wife legislator will at least mark the principal divisions, and not assign penalties of the first degree to offences of an inferior rank. When men fee no distinction made in the nature and gradations of punishment, the generality will be led to conclude, there is no distinction in the guilt. Much as we may be difposed to admire and extol the excellence of the English law in a variety of respects, yet none can otherwise than regret the frequency of its capital punishments; inflicted by a multitude of sueceffive and independent statutes, upon crimes very different in their natures; and we cannot forbear paying our tribute of respect to Sir Samuel Romilly, whose talents and character far exceed our praise, and other legislators, who are laudably exerting themselves in simplifying and mitigating our penal code.

It is a melancholy truth, says Judge Blackstone, that among the variety of actions, which men are daily liable to commit, no less than 160 have been declared by act of parliament to be felonies without benefit of clergy; or in other words, to be worthy of infall death. So dreadful a list, instead of diminishing, increases the number of offenders. The injured, through compunction, will often forbear to prosecute: juries, through compunction, will sometimes forget their oaths, and either acquit the guilty or mitigate the nature of the offence; and judges, through compunction, will repel one half of the convicts, and recommend them to the royal mercy. Among so many chances of escaping, the ready and hardened offender overlooks the multitude that fudder; he boldly engages in some desperate attempt, to relieve his wants or supply his vices; and if, unexpectedly, the hand of justice overtakes him, he deems himself peculiarly unfortunate, in falling at last a victim to those laws, which long impunity has taught him to contum. Boccaccio, whose excellent essay we have often cited in this article, observes, that the more immediately after the commision of a crime, a punishment is inflicted, the more just and useful it will be. It will be more just, because it spares the criminal the cruel and superfluous torment of uncertainty, which increases in proportion to the strength of his imagination, and the sense of his weakness; and because the privation of liberty, being a punishment, ought to be inflicted before condemnation, but for as short a time as possible. Imprisonment, he says, being only the means of securing the person of the accused, until he be tried, condemned, or acquitted, ought not only to be of as short duration, but attended with as little severity as possible. The time should be determined by the necessary preparation for the trial, and the right of priority in the oldest prisoners. The confinement ought not to be clover than is requisite to prevent his flight, or to conceal the proofs of the crime; and the trial should be conducted with all possible expedition. Can there be a more cruel contrariety than that between the indolence of a judge, and the painful anxiety of the accused; the comforts and pleasures of an indolent magistrate, and the filth and misery of the prisoner? In general, "The degree of the punishment, and the consequences of a crime, ought to be fo contrived, as to have the greatest possible effect on others, with the least possible pain to the delinquent." If there be any society in which this is not a fundamental principle, it is an unlawful society; for mankind, by their union, originally intended to subject themselves to the least evils possible.

An immediate punishment is more useful; because the smaller interval of time between the punishment and the crime, the stronger and more lasting will be the association of the two ideas of crime and punishment; so that they may be considered, one as the cause, and the other as the unavoidable and necessary effect.

It is, then, of the greatest importance, that the punishment should succeed the crime as immediately as possible, if we intend, that in the rude minds of the multitude, the seducing picture of the advantage arising from the crime, should instantly awake the attendant idea of punishment. Delaying the punishment serves only to separate these two ideas; and thus affects the minds of the spectators rather as being a terrible sight, than the necessary consequence of a crime; the horror of which should contribute to heighten the idea of the punishment.
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There is another excellent method of strengthening this important connection between the ideas of crime and punishment; that is, to make the punishment as analogous as possible to the nature of the crime; in order that the punishment may lead the mind to consider the crime in a different point of view, from that in which it was placed by the flattering idea of promised advantages. This ingenious writer closes his essay with the following general theorem, as the result of his previous reasoning. "That a punishment may not be an act of violence, of one or of many against a private member of society, it should be public, immediate, and necessary; the least possible in the case given; proportioned to the crime, and determined by the laws." Montesq. Sp. of Laws. Beccaria's Essay on Crimes and Punishments. Blackft. Com. vol. iv.

A valuable work, comprising the subject of this article, was presented to the public in the year 1811 by M. Dumont of Geneva. It was formed of detached materials, furnished by the papers of Mr. Jeremiah Bentham, and the whole is executed with such judgment in the arrangement of the matter, and so much vivacity and elegance as to the style of the composition, that M. Dumont appears more like an original author than an editor. This work would have afforded us many instructive and interesting extracts, if our limits had allowed our making that use of it, which it deserves. This, however, is the less necessary, as the reader may have access to the original treatise, viz. "Theorie des Peines et des Recompenses; par M. Jeremiah Bentham, Juristconseille Anglois; redigee en Francois d'apres les Manuscrits, par M. Et. Dumont de Geneve," 2 vol. 8vo. a Londres, 1811: or to the ample analysis of it in the Edinburgh Review, No 43. A brief account of its contents may, however, be gratifying to our readers. This work consists of two great parts or branches; the theory of penal legislation, and the theory of remunerative legislation. The first contains a systematical form all the principles that serve to regulate the choice of different modes of punishment and the apportionment of punishments to crimes. In the second are exhibited the principles upon which the lawgiver ought to proceed, when he holds out inducements either alone or attended with corresponding penalties, to influence the conduct of his subjects. The first book explains the general principles of the system, and opens with definitions and classifications.

Punishment, in its most general sense, is the infliction of some evil upon an individual, with an intention that he should suffer this evil, and with a reference to some act done or omitted. Punishment, in its legal sense, is the infliction of some evil, according to judicial forms, upon an individual convicted of some act forbidden by law, and with the intention of preventing the recurrence of such acts. Punishments, as well as crimes, are divisible into four classes, as they affect the person, the property, the reputation, or the condition of those upon whom they are inflicted. Those which affect the person, or corporal punishments, are subdivided into various species; they may be simple or complex afflicting, or retificatory, or active (e.g., compulsory labour) or capital. The other three classes are all private, afflicting the delinquent with loss or degradation. Hence arises another general classification of punishments, by dividing them into corporal and privative.

From this definition it appears, that the object of all punishment is the prevention of the offence in future, either by the same delinquent or by other persons in similar circumstances. The first end is accomplished in three ways: by taking from the offender the physical power of committing the offence; by taking away the desire; or by deterring him. The other, and principal object of the infliction, that of restraining others, can only be effected as far as the punishment is concerned, by the threat which it holds out of similar infliction. These objects, as they form the only just motives, constitute also the only justification of punishments. Although the direct and primary object of punishment is prevention, the civil magistrate, having provided for that object, has another duty to perform, which is to provide as far as possible for the reparation of the injury suffered through the crime committed.

The expense or cost of any punishment is, in the language of this system, the whole evil of every kind occasioned by it, including the suffering of the delinquent, the loss of his labour or life to the state, the pecuniary cost of his punishment; and, in short, every thing endured, paid, or foregone, in order to obtain the double preventive which the punishment is intended to administer. The gain or profit of the punishment consists in this preventive, or in the tendency of the punishment to secure it. A punishment may be termed frugal or economical which produces the desired effect with as little suffering as possible; and it may be termed costly or prodigal, when the same effect might have been produced by a smaller degree of suffering. The real value is distinguished from the apparent value, of the suffering: the former being the actual amount of that which is inflicted; the latter, the estimation of it which is exhibited, or otherwise made known to, and understood by the public. The expense of a punishment is equivalent to the real amount; the profit is in proportion to the apparent amount only; and hence are deduced these important maxims: 1. That, ceteris paribus, a punishment easily comprehended, is preferable to one of difficult apprehension. 2. That one which takes hold of the memory, is preferable to one easily forgotten. 3. That one which is as great or greater in apparent than in real amount, is preferable to one which is really greater than it appears to be: the excess of real amount being in truth so much thrown away, so far as regards the principal object, of general example.

The next subject of discussion comprehends the principles that ought to regulate the extent of punishment, for the prevention of crimes. These are contained in the following propositions. 1. The evil of the punishment must exceed the advantage arising from the crime; so that, generally speaking, the stronger the temptation to commit any crime, the more severe ought to be the punishment, subject to exceptions in extreme cases. 2. When the criminal act evidently indicates a habit or practice, the punishment should be proportioned, not to the gain derived from a single offence, but to the probable amount of profit flowing from a course of such conduct. 3. An addition must be made to the punishment, in order to compensate its want of certainty and proximity. 4. In cases where a temptation offers for the committal of different crimes, a more severe punishment should be denounced against the greater crime. 5. The more pernicious any crime is, the more safely may a severe punishment be ventured upon, for the chance of preventing it. 6. The nominal amount of punishment for the same crime, must often be varied at the discretion of the judge, according to the circumstances of the delinquent, in order to preserve the real amount of suffering.

The qualities of punishment, the consideration of which naturally succeeds that of the measure or quantity, are such as follow: it should be divisible; invariable, or certain; commensurable with others; analogous to the crime; exemplary; economical; remissible; that it should restrain the offender from doing harm; conduct to his reformation; yield a profit, in the ordinary sense of the word; be simple in its description;
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description: and so far popular as to shock none of the established feelings or prejudices of the community. These qualities are, for the most part, understood as soon as they are mentioned. Some of them, however, undergo a more ample discussion than others. This is the case with respect to the qualities of analogy and popularity. One of the sources of analogy specified by Mr. Bentham is that of employing the same instrument or operation in the punishment, as the delinquent did in the crime, as, e.g. burning an incendiary who had committed any aggravated act of arson, by which lives were sacrificed as well as property. Another method is that of inflicting on the delinquent the same injury which he offered to the innocent person. A third consists in subjecting to punishment the part of the body with which the offender committed the crime. All these, in affecting the face with some disfigurement similar to disfiguring, where part of the offence was the use of a disguise. Other analogies also are enumerated. In discussing the popularity of punishment, the author advert to the prevalence of false feelings and prejudices, and he reduces the errors proceeding from these causes to four heads: as they concur in mistaken notions of liberty, decency, religion, and humanity. The author allows, however, that a lawgiver should, for a time at least, frame his institutions so as to humour even the caprices and errors of his people, when he finds them too deeply rooted and widely spread, to be overcome or disregarded. To any speculative arguments, founded upon false views of those different subjects, of course no regard should be paid—as to those fanatics in politics, religion, or sentiment, who would have no imprisonment because it violates liberty, or abolish capital punishments because they encroach upon the province of the Deity, or because they are painful to the feelings.

The author mentions four cases, in which punishment is wholly inept, and ought not to be inflicted: viz. where the crime being either imaginary, or unfelt for legislative interference, may be laid not to exist, and the punishment would be unfounded; where the punishment would be wholly insufficient on the delinquent, or others in the same circumstances, as in the case of idiots: where the means being sufficient to accomplish the end in view, punishment would be superficial: where more evil being likely to result from punishing the particular offenders than from letting them escape, the infliction would be too costly, as in the case of an extensive mutiny or rebellion.

We have already stated, that the author divides punishments into two great classes, corporal and privative; that he again subdivides corporal punishments into five kinds, and privative into three. 1. The first class of corporal punishments consists of punishments simply afflicting, denoting those which cause bodily suffering, with little attendant injury; and even those mortally simple, as the lafh, are accompanied with a certain disgrace by their public exhibition, which is an essential part of the process. Of the various kinds of simple infliction, our author gives the preference to the lafh, under certain modifications. 2. The second class consists of punishments complexly afflicting, or those in which the mere bodily suffering is attended with, or followed by, some other loss, either of personal comfort or reputation. These are subdivided into three kinds, comprehending those that are inflicted by deforming the person, which is done either by disfiguring, e.g. gr. burning in the hand; or dismembering, e.g. cutting the nose, or cutting the ear; by disfiguring a limb or organ, without destroying it; by mutilating or destroying the part. The third class comprehends retributive punishments, which prevent the offender from doing or enjoying something agreeable or useful to him. The restrictions thus imposed are of two kinds; simple prohibitions, and restraints upon loco-motion. The former are so limited in their application, that we need not particularly specify them; but the latter are divided into five kinds; viz. imprisonment, in the ordinary sense of the word; quasi-imprisonment, or confinement within the district to which the offender belongs: relegation, or confinement to some other district within the dominions of the state: local interdiction, or banishment from a particular district: banishment from the territories of the state, either indefinitely, or to some specific foreign part. Imprisonment, according to our author’s statement, in order to be equal, ought to place the offender, for a limited time, under the most complete restraint, instead of being long and flight. Mr. Bentham enlarges in the enumeration of the evils comprehended under this mode of suffering, of which some belong infalutably and necessarily to it: others such as are necessary, but most frequently accompany it; and others again such as arise from abuse of it. With imprisonment, he says, in certain cases, and always for a very limited time, may most advantageously be joined solitudes, darknese, and regimen. Our author, having exposed the absurd system of “prison-fees,” infers from his general principles that there ought to be three kinds of prison, adapted to the several purposes of simple detention, penitentiary confinement, and perpetual imprisonment. The first being only applicable to the case of insolvent debtors guilty of imprudence or extravagance, and of accursed persons kept for trial, should have no accompaniment whatever of rigour. The leading principle in distinguishing the two others is, that the subjects of the former are to enter again into society; while those of the latter, being for ever excluded from it, the exemplary nature of their sufferings should be the principal object of attention. The names of the three prisons, for these separate purposes, should be different, as well as their external appearance; and every thing which can seize hold of the imagination, without awakening sympathy, should be preferred, both in the construction of the perpetual prison, and in the situation of its inhabitants. 4. The fourth class of punishments comprehends those that are termed active or laborious. Punishments of this class, when examined by the rules already premised, are found to unite the greatest number of advantages with the fewest defects. In the discussion of this subject, the author directs our attention to what may be called the extreme case of mismanagement in this kind of punishments. Here he alludes to Botany Bay. The transportation of convicts to America, which preceded the present plan, with several disadvantages of great moment, was, upon the whole, infinitely preferable. It was grossly unequal, inasmuch as it became lervitude with exile to the poor, while it was only simple regulation to those who could pay for their passage. It was defective too in preventive power, the opportunities of escape being necessarily great. In both these particulars, the deportation now practised has the manifest advantage. All the convicts are equally under restraint, and their escape is much more difficult; but in every other point of view, it is either as bad, or a great deal worse. It is as little as possible exemplary: the disproportion between the real and apparent suffering, the excess of the former, is in truth a maximum. The community in this country fee a convict sent on a long voyage, to a fertile country, lying in a fine climate. This is the example. The reality is, that the miserable wretch, after rotting in the hulks for a year or two, is crammed with some hundreds of his fellows into a floating prison, or, it may be, a debt-house, in which, if he survives the ricks of famine, pestilence, mutiny, fire, shipwreck, and explosion, he is conveyed, through the

imagination.
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Fiction of a ten months' voyage, to a life of alternate slavery and rebellion, where guilty or cruel excess succeeds exquisite suffering, without varying the uniform misery, or changing the prevalent character of the body; and all this passes at the opposite extremity of the earth's diameter, from whence it operates no more in any manner of way upon the inhabitants of England, than if it were paling in the moon. The tendency of discipline in the colony to reform the convicts, fupposing them to have arrived there, may easily be estimated. They are not separated from their companions in guilt; they have no better examples before them, no eyes to watch them. The partial historian of the rising rebellion, himself the chief magistrate, (Mr. Collins,) has supplied us with the details; and, in spite of his inclination to see every thing in the fairest light, he has painted, if the pages of a journal for sixteen years may be laid to paint, by far the blackest picture ever yet exhibited of human society. His book is a catalogue of crimes; it would be a record of convictions, but that perjury so universally prevails as to ensure the escape of all who are not taken in the fact. The vice at the root of all the rest, a rage for spirits approaching to frenzy, can neither be cured, nor deprived of gratification. Far from improving by their refuge there, it was only at the first establishment that any remission of unfavourable symptoms appeared. As soon as the first convicts had finished their period of servitude, their liberty brought along with it an influx of disorder and contamination, which each succeeding year seems to increase. If this system, then, prevents the delinquent from repeating his crimes, it is only by transferring the scene of their to a distant settlement, where it softens and augments them; and although, with reference to one part of the empire, this may be termed prevention, the legislator, whose care should embrace the whole, has no right to give it such a name. As to the pecuniary expense, by which so much evil is purchased, we find it in the parliamentary reports estimated at above a million in about ten years, or about thirty-eight pounds for each convict, besides the value of his labour. Last of all, the punishment inflicted is perfectly different from the one to which the sentence of the law has condemned the convict. Not to mention the detention before transportation, and the arrival sometimes when the term of punishment has nearly expired, the power of returning at its expiration is poiffessed by few men, and no women; while of the voyage some idea may be formed, from the average mortality between 1787 and 1795, being above one in ten; and from a jail fever, always a probable occurrence, on one occasion, in 1795, having carried off one hundred in three. If, in such a case, we could look to the settlement as a colonial speculation, we should find its gains in a similar proportion; but this estimate would be as superfluous after what has been said, as it would be foreign to the design of this inquiry.

In the work before us we have a general sketch of the author's plan of improvement upon this system, together with a view of its connection with the principles which he has unfolded, and of the prodigious advantages accruing from it. The "Panopticon" is distinguished by three leading properties. From the form of the building, and the disposition of the cells, the inspector can see each prisoner at all times, without being seen by them, and can direct them without leaving his post: the management of the establishment is carried on by contract, the government paying a fixed price for the whole expenses of each convict, and the contractor having the whole profit, as he has the entire charge and regulation, of the work to be performed, but allowing a certain proportion of the gain to the convict:

the contractor infures the lives and safe custody of the convicts; he is allowed yearly a certain sum for the deaths, as calculated from the common tables, and he pays the same sum for each death which actually does happen, and for every escape which takes place. If we mistake not, Mr. Bentham, by his contract with government, further engaged to pay so much for each prisoner who, after his discharge, should afterwards be convicted of any offence. The entire publicity of his accounts was another condition, and one upon which he himself insisted. The Panopticon was to be open at all times to every magistrate, and at certain hours to the public generally.

The most striking points of the comparison between both systems, as they are presented to us by the anonymous author of the article on the subject in the Edinburgh Review, are such as follow. The punishment is in the highest degree exemplary; it is all seen and understood; it appears much greater than it really is; the comforts of the convicts, in their intercourse with each other according to their improvement, and in the state of industry, and cleanliness, and wholesome regimen, for which they have exchanged their ordinary habits, being, however real, by no means such as strike the multitude of spectators, who only see confinement, compulsory labour, and ignominy. The reforming effects of the plan are equally manifest: the labour, to which they are in part allured by a fixed allowance of profit; the perfect temperance in which they live; the facility afforded of separating them into classes, according to their habits and behaviour; the means of easy instruction, both religious and other, which they give: all furnish as good a chance of reclaiming those unhappy persons who are not hardened in guilt, as from any such discipline can reasonably be expected. The preventive powers of the Panopticon are complete, while the convict remains in it; and although a relapse after liberation can only be guarded against by reformation, a contrivance is added to this establishment, admirably calculated to provide against the first dangers of the discharge: the convict is transferred to another place of mitigated confinement, where he is rather under inspection than in custody, and from whence he is gradually allowed wholly to withdraw. With respect to the cost of the plan, we may form some estimate of it from the terms of Mr. Bentham's contract. Each convict was to cost government 35l. 10s., including 1l. 10s. for the proportion of the expenses of building and ground. He was to provide a fund for indemnifying the parties injured; to allow the convicts one quarter of the profits of their labour; and, after the first trial, to make a reduction in the charge. Practical men, well versed in such matters, had no doubt that a very considerable reduction might have been speedily afforded; and that in a few years, the profits would entirely defray the expenses of the establishment to the state. While all manner of delays and difficulties were thrown in the way of this experiment: while wits and jobbers, or, as they termed themselves, matter-of-fact men, averse to theories, and deprecating novelties, were employed in running it down; trials were made in America of penitentiary houses upon similar principles, though in a much less perfect shape, and without some of Mr. Bentham's chief improvements. We have the most irrefragable testimony borne to their success, by the interesting narratives of the da de Rocheouault Liancourt and captain Turnbull: the one a perfon eminently skilled in the subject of prisons; the other a more practical observer, imbued with no knowledge beyond that of the naval profession. Both these very different witnesses concur in their statement of the salutary consequences of the plan; and if we wished to find a perfect contrast to the melancholy
mellancholy narratives of Mr. Collins, we could certainly
nowhere so well be suited as in the descriptions which the
French and English travellers have given us of the convicts

5. Capital punishments compose the fifth clas.
This clas consists either of simply infliction of death with the least
possible degree of suffering, or in accompanying the destruc-
tion of life with torment. The latter method, at one period
universally prevalent, and still known in most countries, is
happily almost abolished in the two most civilized nations.
In France, the Code Napoleon allowed it only in the cases of
parricide, and attempts against the sovereign’s life, where
the addition made to the punishment of death is cutting off
the right hand. In England, it is only in the case of high
treason that such augmentations are allowed: the punish-
ment of the law is no doubt barbarous in the extreme, but
in practice it is always remitted. All such cruelties have the
effect of inspiring pity in the spectators towards the crim-
inal, and of rendering criminals more hardened and sav-

The ingenious author of the critique on Mr. Bentham’s
theory, to whose analysis of the work we are so much in-
debted in the compilation of this article, agrees with him in
his objections to Beccaria, who maintains that a punishment of
longer duration is more terrible to the spectator. Clearly
there is none so dreadful as death. M. Dumont adds,
that its apparent suffering is greater than its real, which
applies only to the pains of it. On the other hand, it ex-
ceeds all others in some material defects; not only is it ex-
ensive, and beginning to become unpopular; it is quite
irremissible, and it is in the highest degree unequal, and in-
capable of division or apportionment. A very satisfac-
tory statement is given under this head, of the evil tendency of
frequent executions, of the kind of reasoning by which of-
fenders at the moment of temptation get rid of the fear of
death, and especially of the wide difference between encoun-
tering certain destruction, and yielding to impulses which
may lead to it. The evils arising from its being irremissible
are also ably expounded; yet we think the author has
neglected to consider how much of its horror consists in this
quality. It is manifest that no other punishment can utterly
exclude hope. In comparing capital with other punish-
ments, our author is disposed to give the latter the pre-
ference, almost to the exclusion of the former; chiefly be-
cause, however exemplary to men in general the infliction
of death may be, and how deep forever the impression it
makes on their minds, it has not the fame terrors for the
clas of men most likely to commit the worst offences, vi-
olent spirits and hardened delinquents. That its range shou-
d be extremely limited, we are willing to admit; but we
differ from him in the position, that for this clas of men,
perpetual confinement to hard labour would have more
terrors than death. The total extinction of life, without
chance of escape, pardon, or mitigation, ought still to be
denounced against the worst offences; and, by being con-
ined to those, will unquestionably become doubly terrible.
The evils arising collaterally from the abuse of this punish-
ment, are so ably pointed out by sir Samuel Romilly, that
our author abridges a part of the treatise before us, by re-
ferring to his tract.

The other great division of punishments in Mr. Ben-
tham’s theory, consists more peculiarly in privation. These
may be arranged in three clas, as they impose a for-
feiture of reputation, of property, or of condition. 1. Punish-
ments which affect a man’s reputation consist of appeals
to public opinion, and are those meaures which the law-
giver takes with respect to him, for directing that opinion
against him. The lawgiver may inflict punishments of this
kind, or rather may expose the offender to have them in-
flicted, either by simply denouncing, with the authority
belonging to his functions, that certain acts shall be deemed
infamous, or by treating the particular offender judicially in
a certain way. The latter is the mode used in modern
times; and it is practiced in different ways; by publication
of the offence;—by judicial admonition;—by inflicting punish-
ments of the other clas, corporal as well as privative, the
immediate object of which is not the destruction of repu-
tation;—by inflicting what may be termed quasi-corporal
punishments, the sole object of which is infamy;—by de-
gradation, or depriving the offender of his rank, natural or
conventional;—by discrediting him, or preventing his testi-
mony from being received. 2. The description of punish-
ments affecting property consists of those which are pecu-
niary, and which are quasi-pecuniary, as confiscation of lands, &c.
3. The forfeiture of condition, or status, though a clas of
great extent, theoretically speaking, is in practice reduced
within narrow limits. Marriage may be dissolved; children
may be bastardized; blood may be corrupted; the different
kinds of trust may be taken away; a person may be re-
duced to slavery; a community may be deprived of its
rights and privileges. Outlawry may also be referred to
this head.

There are other kinds of infliction, which every found
principle teaches us to avoid where it is possible, and to
diminish as much as possible, where, from the defects of all
human contrivances, they inevitably mingle themselves with
the legitimate modes of punishment. Our author’s syste-
arranges them in two clas; those which are misplaced, or
which fall upon other persons than the offender; and those
which are complicated, or present neither to the legislator,
the judge, the party, nor the public, any fixed and definite
idea. Those punishments that are misplaced, in the proper
use of the term, or which the legislator enacts with the
intention of punishing another person than the offender,
either along with him, or in his place, confit of four
kinds; viz. vicarious, where the offender escapes;—transfere,
where an innocent person is purposely punished who is con-
ected with the offender;—collective, where a body of
innocent persons suffer, in the punishment of the guilty
being among them;—and fortuitous, where an innocent
person suffers as well as the offender, though unconnected
with him. The only instance of vicarious punishments is
that inflicted upon the families and creditors of suicides
by the law of England. This, like all other absurd and un-
just laws, is evaded, in almost every instance, by perjury,
and the exercise of discretion in a sovereign. The example
given of transfere punishment is the corruption of blood,
the abridgment of which is ably exposed. The chief inflicts
of collective punishments are those in which corporations are
punished for the ‘faults of certain individual corporations;
proceeding which can never be justified. The well-
known examples of fortuitous punishments are taken from
the law of England. The most notable is the forfeiture
and efech of frehold property, in cases of attainder of
treason and felony, where the confiscation relates back
to the commissio of the offence, and all meane conveyances
are avoided; so that a man may commit a secret crime, and
fall his estate to an ignorant and innocent purchaser, in
whose hands the crown or the lord afterwards feizes the
estate upon the vendor’s attainder; and as his goods and
chattels are forfeited upon conviction, the only fund of
compensation is gone afo. Decendants are another infliction
of similiar injustice; and the punishment of incapacitating a
person from giving evidence, is manifestly one which may
be
strike more injuriously at parties wholly unconnected with the offender, than at himself; besides, that it is by no means inflected merely with the view of putting courts of justice on their guard against admitting a bad witnese; for it is often the punishment of crimes which have no peculiar connection with violation of truth.

Among the evils of complicated punishments, we may reckon, besides outlawry and incapacitation of giving evidence, excommunication and felony. Some gross abuses having occurred in the infliction of the punishment of excommunication, several distinguished persons have undertaken to substitute other procedure in its place; and Sir W. Scott brought a bill into parliament with this view, so that the evil is done away. The punishment of persons as felons, comprehends a number of infestions very different from each other, so that our author considers the punishing of a felon to be a vague and indefinite term. This comprehends two descriptions of punishment; the one capital, with forfeiture of lands and chattels; the other not capital, but confining in forfeiture of chattels, and the form of burning in the hand; to which, by special enactment, imprisonment, transportation, or indeed any other punishment, may be superadded. It must be acknowledged, that a much simpler and better manner of slating the punishment due to an offence would be, to tell at once of what it is to be conceived; and instead of enacting that certain offences are felonies, which specifies nothing, to prohibit them, and slates the precise infestions which shall follow the commissio

Punishment, in Theology. It has been disputed among divines, whether the punishment of the wicked in a future world be strictly eternal or not. For the arguments on both sides of the question, see Hell.

Punitive Interest, in the Civil Law, such interest of money, as is due for the delay of payment, breach of promise, &c.

Punk, in Natural History, the inward part of the excrecence or exuberance of an oak. It is used by the Indians of Virginia for medicinal burning, as the Exit Indians use moxa. Phil. Trans. No. 454. p. 1-11.

Punn. See Pun.

Puno, in Geography, a town of Peru, now annexed to the vicerealty of La Plata or Buenos Ayres, and capital of a district of the same name, called also Paucarcolla (not Pauarcolla, as it is misprinted in that article). It is a rich and populous town, situated on the W. side of the lake Titicaca, and containing some illustrious families, as well as a beautiful church for the Spaniards, and another for the Indians, who weave great quantities of coarse cloth, with which they supply the neighbouring countries. S. lat. 16° 20'. W. long. 70° 26'.

Punt, in Sea Language, a sort of oblong flat-bottomed boat, with a square head and stern, whose floor resembles the platform of a floating stage; and used by shipwrights for breaming, caulking, or repairing a ship's bottom. It is also used in some canals.

Punta, in Geography, a town of South America, in the audience of Quito, and jurisdiction of Guayaquil.

Punta, La, a town of Mexico, in the province of New Biscay; 40 miles N.N.E. of Durango.

Punta is also an epithet, distinguishing several capes, which are too numerous to be here recited; and this is the least necessary, as the principal of them occur under other appropriate titles.

Punta Entornada, a town on the N. coast of Spain. N. lat. 43° 34'. W. long. 7° 32'.

Punta del Guada, a sea-port and capital of St. Michael, one of the Azores, defended by a castle.

Punta de Tordera, a town and cape of Spain, on the coast of Catalonia. N. lat. 41° 38'. E. long. 2° 37'.

PUNTO DEL MONTE, a town of South America, in the province of Cordova; 15 miles S. of Cordova.

Punugga, a village of Bootan, situated in a deep hollow, and surrounded with mountains, for the most part covered with pines, along whose sides clouds are perpetually hovering. On the borders of this village are many large heaps of fir-leaves, which being left to ferment and rot, are used as excellent manure.

Pununagalur, a town of Bengal; 10 miles W. of Nattore.

Pununay, a town of Hindooistan, in the circar of Gohud; 18 miles E. of Raat.

Puolango, a town of Sweden, in the government of Ulea; 40 miles S. of Cajana.

Pupa, in Natural History, a name lately suffixed in the room of chrysalis or auroria, because many insects in this state resemble an infant in swaddling clothes; and all, except those of the hemiptera order, take no nourishment. See Entomology.

Pupigliio, in Geography, a town of Etruria; 10 miles N. of Pisa.

Pupil, Pupilus, in the Civil Law, a boy or girl not yet arrived at the age of puberty, i.e. under fourteen years of age for the boy, and under twelve for the girl.

While a minor remained under the direction of a tutor, he was called a pupil; after puberty, a curator being assigned him, he ceased to be called a pupil.

A tutor is obliged to pay interest for what monies of his pupil lie idle and unemployed. A tutor is allowed to do any thing for his pupil, but nothing against him.

Pupil is also used by way of extenuation, in Universities, &c. in the sense of alumnus, for a youth under the education or discipline of any one.

Pupil, in Anatomy, the round opening in the iris, by which the rays of light are admitted into the eye. See Eye.

Pupil, in Optics. It is observed, that as we are forced to use various apertures to our optic glasses, so nature has made a like provision in the eyes of animals, whereby to shut out too much, and admit sufficient light, by the changes in the aperture of the pupil.

The structure of the uvea and iris is such, that, by their aperture, the pupil is contractile and dilatable at pleasure, so as to accommodate itself to objects, and to admit more or fewer rays, as the object, being either more vivid and near, or more obscure and remote, requires more or less light: it being a constant law, that the more luminous the object, the smaller the pupil; and again, the nearer the object, the smaller the pupil; and vice versa.

This fact has been long ago noticed by optical writers. B. Porta, about the middle of the sixteenth century, in his treatise De Refractione, p. 74, observes, that the pupil is contracted involuntarily when it is exposed to a strong light, and opens of itself when the light is small. A similar observation was made by his countryman and contemporary, Father Paul of Venice. Galen, indeed, first observed the dilatation of the pupil of one eye, when the other was shut or loth, and the contraction of it, when the other was opened or recovered; and in this opinion he was followed by all naturalists and philosophers, till Fabricius ab Aquapendente, professor at Padua, by observing the eye of a cat, found
found that the pupil not only dilated and contracted itself, when one of the eyes was shut, but also when both were open. F. Paul found, from repeated experiments, that the pupil not only of cats, but also of men, and other animals, always contracted itself when the eye was exposed to a bright light, and again dilated itself when the light was faint and languid. This he always observed, as well when both eyes were open, as when one of them was shut. The same remark was made by Achiilinus, in a treatise published in 1522; and the fact was known to the Arabians, Rhazes and Avicenna. That the pupil of the eye is enlarged, in order to view remote objects, and that it is contracted while we are viewing those that are near, is a fact with which Scheiner, in the beginning of the seventeenth century, was well acquainted, and which he proved by experiments, and illustrated by figures. When a needle, or any small object, is brought near to the eye of any person, who looks attentively at it, the pupil, he says, is plainly seen to contract; and it as constantly expands whenever it is withdrawn.

This alteration of the pupil is effected by certain muscular fibres on the outside of the uvea, which arrive from nerves detached hither from the sclerotic. These fibres proceeding straight from their origin towards the centre, terminate in the orbicular limb or zone of the pupil, which consists of orbicular fibres, whereby the figure and space of the pupil are defined. The first, or longitudinal fibres, dilate the aperture of the pupilla; the latter, or orbicular ones, constringe it.

Some authors, however, attribute the motions of the pupil to the ligamentum ciliaire; and others think, that both this, and the fibres of the uvea, concur herein. Dr. Derham adds, that while the pupil opens and shuts, the ligamentum ciliaire dilates or comprizes the crystalline, and brings it higher to, or farther from, the retina, as the object is more or less remote.

There is no doubt that the change to which the pupil is subject is the effect of light upon the eye. Dr. Hartley, Obs. on Man, vol. i. p. 219, supposes, that the light which enters at the pupil has great efficacy in contracting both the greater and less rings of the iris, as may be concluded, he says, from the immobility of the pupil in a gutta serena; also because, on this supposition, the light which passes in at the pupil mutt, by contracting the less ring, become a check and guard against its own too free admission, which is agreeable to the tenor of nature in like instances. The retina, he observes, extends to the greater ring, and may send some nervous fibres to it, and even to the iris. Dr. Whytt also says, Essay on vital and involuntary Motion, p. 112, that the contraction of the pupil is not performed by the action of light upon the iris, but upon the retina; since whatever intercepts the rays of light, so as to prevent their reaching the retina, causes a preternatural dilatation of the pupil; because in a cataract, where the crystalline humour, being considerably opaque, intercepts a great part of the rays, the pupil loses a good deal of its contractile power. This author also observes, that the wideness of the pupil in a syncope, apoplexy, and confirmed gutta serena, shews that, in order to dilate the pupil to its largest size, no effort of the mind is necessary, but only the superior contractile power of the longitudinal fibres of the uvea, when its circular muscles is not excited into action by the stimulus of light on the retina. M. Mery informs us (Mem. Ac. Paris, for 1704) that, having plunged a cat in water, and exposing her eye to the strong light of the sun, the pupil was not at all contracted by it; whence he infers, that the contraction of the iris is not produced by the action of the light, but by some other circumstance. For he contends, that the eye in this situation receives more light than in the open air. M. de la Hire, in reply, endeavours to shew, (Mem. Ac. Par. for 1709) that fewer rays enter the eye under water, and that, in those circumstances, it is not so liable to be affected by them. Besides, it is obvious to be remarked, that the cat must be in great terror in this situation; and being an animal that has a very great voluntary power over the muscles of the iris, and being now extremely attentive to every thing about her, she might have her eyes open, notwithstanding the action of the light upon it, and though it might be very painful to her.

The figure of the pupil, in various animals, is wonderfully adapted to their various circumstances and occasions; in some, e. g. in man, it is round, that form being most fitted for the position of our eyes, and the various uses we make of them in all directions.

In others, it is elliptical or oblong; in some of which, e. g. the horse, sheep, ox, &c. the elliptis is transversely, and the sillure large, to enable them to see laterally, and even with a little light; and thereby both to gather their food the better in the night, and to avoid dangers on either side. In others, e. g. the cat, the elliptis is erect, and is also capable of opening very wide, and shutting very close, by means of the latter of which states, that animal can exclude all, but, as it were, a single ray of light, and so avoid all the inconveniences of the bright sun; and by the former, it can take in all the faintest rays, and thus avoid the inconveniences of the night: an incomparable provision for these animals, which are to watch and way-lay their prey both by day and night, to see upwards and downwards, to climb, &c. See Eye and Vision.

Pupil. Closurc of. A preternatural smallness of the pupil always renders the patient incapable of discerning objects well at night-time, and occasions a diminution of vision. The consequence of a complete closure of the pupil, a cafe termed synecrisis, is total blindness. Both these affections only differ from each other in degree, and they originate from the same causes. The most frequent cause is a violent inflammation of the eyes, particularly when such disorder extends to the iris, and arises at a period when the anterior and posterior chambers of the aqueous humour contain none of this fluid. This case principally happens after the extraction of the cataract. Here the inflammation constantly affects the capsule of the crystalline lens, so as to make it opaque, and at the same time adhere behind the pupil to the iris; a circumstance which is well deserving attention. Not unfrequently, however, a closure of the pupil takes place during ophthalmia, notwithstanding both chambers of the eye are full of the aqueous humour. Wounds of the iris sometimes cause this unpleasant occurrence, especially when they continue open, and do not heal. It is observed to be most frequently produced by such wounds as divide the radiated fibres of the iris transferly. These wounds, however, do not invariably remain open; sometimes they close, and then the pupil undergoes no alteration. Even when such wounds do not unite, a closure of the pupil does not always follow. In these instances, the natural pupil has been remarked to become closed, and the preternatural aperture in the iris to be widened, when the eye was exposed to the light; and, on the contrary, immediately the light was diminished, the pupil became dilated, and the other opening was contracted and closed. Wounds of the iris in the other direction, even when they remain dilated, often cause little or no diminution of the natural motion of the pupil.

It sometimes happens, that a greater or lesser portion of the iris is detached from the circumference of the cornea;
ternaturally dilated. In all such cases, the only indication is to endeavour to remove the original disease, of which the mydriasis is merely a symptom.

In the case where mydriasis is to be regarded as the only disorder, the complaint seems to depend upon a weakness or paralysis of the fibres which close the pupil. Here it is commonly the consequence of apoplexy, a blow on the eye, or a violent and sudden dilatation of the pupil, as, for example, sometimes happens in the extraction of a cataract. When the disease is of long standing, there is little hope of cure, whatever may be the cause from which the complaint arises. When it is recent, the pupil will sometimes regain the power of moving and contracting under the use of internal and external stimulating tonic remedies. The chief means of this class are, blisters applied to the eye-brows, ethe real oil rubbed into the skin around the orbit, electricity, emetic medicines in small and full doses, and other similar remedies, which are usually preferred for the relief of paralytic affection of other parts. When these means prove unavailing, the practitioner must be content with recommending a palliative plan, which will be presently noticed.

As the pupil naturally dilates in the dark, it follows, that when a person is kept a long while away from the light, a mydriasis is produced, the pupil becoming habituated to the expanded state, and losing the power of contraction. In most instances, it gradually recovers its motion after the eye has been for a certain time exposed to the light again. The light, however, must be allowed to get to the eye only by degrees, or else its sudden operation on the eye, in the expanded state of the pupil, would be apt to impair, or even destroy vision altogether. When the pupil does not recover its power of motion, the patient must be satisfied with resorting to palliative means. It has been remarked, that mydriasis is sometimes a congenital defect. All attempts at a radical cure must here be attended with extreme difficulty. When the light cannot be endured without inconvenience, the palliative plan is necessary. A blow on the eye sometimes tears the pupil. The rent most often remains open, and the patient is in the same state as if affected with mydriasis. Here, as the laceration cannot be repaired, the indication is to prevent, by palliative means, vision from being hurt by the too great strength of the light.

Through a preternaturally dilated pupil the light enters the eye in such quantity, that the patient is blinded. He not only sees things very indistinctly in light places, but he also runs a risk of being gradually entirely deprived of vision, in consequence of the too strong action of the light upon the eye. The prevention of such mischief is the object of the palliative treatment. By it the light which falls upon the eye is to be diminished, so that the patient may be enabled to see not only plainly and without inconvenience in light places, but also without any danger of losing his sight altogether. The usual means recommended for this purpose are, eye-shades, by which the light, coming principally from above, is kept from entering the eye; black veils over the face; green spectacles, which lessen the quantity of rays of light coming from objects which the patient is looking at; spectacles made with black cards, in the centre of which is left an opening of the size of the natural pupil. But the best and most proper means is a pair of tube-spectacles. This is a common pair of spectacles, which, instead of glasses, has adapted to its two rings two conical tubes, the bases of which are to be put towards the eyes, and the narrower parts towards the objects which are looked at. These tubes ought to be made of black leather, and they should be three or four inches long. Their diameter at the base must be equal to that of the circumference of the orbit; but their other ends need not be quite so wide. The edge of their bases is to be cut in such a way, that they will fit closely on the circumference of the orbit. The use of these tubes consists in their keeping off all the rays of light coming laterally, and only admitting those into the eye, which proceed from objects in the axis of vision. Every surgeon will be able, according to circumstances, to multiply and vary the contrivance here described. See Richter's Anfangsgr. der Wundartzneykunst, band 3, cap. 10.

PUPILLARIS Membrana, in Anatomy, a circular membrane, by which the pupil is closed during the greater part of utero-geisation. See Eye.

PUPILLARITY, or Pupillage, the state of a pupil; in opposition to puberty.

PUPPET, in Natural History. See Aurelia.

PUPPISOS, a name given by some authors to the forehead. The future in this bone is also called by many anatomists the futura puppis.

PUPPOLA, in Geography, a town of Sweden, in the government of Ulea; 45 miles S. of Ulea.

PUPULE, a name used by some to express the extremities of the fingers.

PUR, in Geography, a river of Russia, which runs into the Tazovskiia gulf. N. lat. 67° 40'. E. long. 78° 34'.

Pur autre vie, in our Law-Books, is used where lands are held for the life of another. See Occupant, and Tenant.

PURA Eleemosyna, pura alia, denotes a tenure, whereby the churchmen hold lands in Scotland, somewhat on the footing of the primitive clergy.

Pura Hasta. See Hasta.

PURALLA BAY, in Geography, a bay on the coast of Chili. S. lat. 42° 10'.

PURANA, the common name of a series of poetical romances, considered among the Hindoos as sacred works, the offspring of inspired writers, communicated for the instruction and benefit of mankind. They are ascribed, in their present form, to a celebrated man in the literary history of the Hindoos, whom they call Vyasa. (See VYASA.) He is supposed to have reduced an immense mass of inspired writings into eighteen works, and to have arranged them as they now appear. The following are the titles of these eighteen books, to which the common denomination of Purana is appertained when spoken of or referred to. 1. Brahman, or the Great One. 2. Padma, or the lotus. 3. Brahmaunda. 4. Agni, or fire. 5. Vihnu. 6. Garuda. 7. The transformations of Brahma. 8. Siva. 9. Linga. 10. Nareda. 11. Skanda. 12. Markandeya, or the immortal man. 13. Bhavihiya, or the prediction of futurity. 14. Matiya. 15. Varaha. 16. Kurma. 17. Vamana. 18. Bhagavata. Of these, the first four relate to cosmogony; the next nine to the attributes and powers of the Deity. The sixth is named after the vehicle or bird of Vihnu, called Superna, as well as Garuda. (See SUPERNA.) See Linga, for the mysterious symbol whence the ninth derives its name. Nareda, whose laws and history are detailed in the tenth, is a mythological son of Brahma. Skanda, the hero of the eleventh, is a name of Kartiya; see that article. The fourteenth and three following relate the histories of four of the principal incarnations of Vihnu the preformer, called Matsyavatara, Varahavatara, Kurunavatara, and Vamanavatara. Under these articles respectively will be found a brief notice of the outline of their histories. The eighteenth, called Sri Bhagavata, is the life of Krishna, (see KRISHNA), with
with which the poet Vyafa is popularly imagined to have crowned the whole series; though some reasonably assign them different composers; and the series is differently arranged and named by other authorities. Every Purana treats of five subjects. 1. The creation of the universe. 2. Its progress, and the renovation of the worlds. 3. The genealogy of gods and heroes. 4. Chronology, according to a fabulous system. 5. Heroic history, containing the achievements of demi-gods and heroes. Since each Purana contains a cosmogony, with mythological and heroic histories, they may, not unaptly, be compared to the Grecian theogonies.

A copy of, we believe, all the eighteen mythological poems, is preserved in the library of the East India House. It is estimated that the whole cannot consist of less than half a million of folios. Hitherto no translation of any of them, or of any considerable portion of either, hath been made from the original into any European language. They are, of course, written in the Sanscrit tongue. In some articles of this work a fanciful, or a brief outline of some of the Puranic tales, elucidatory of the character or subject under discussion, is occasionally introduced, and may perhaps give some little idea of the style of these extravagant poems. The reader, in this view, may consult the following, in addition to the other articles herein and thence referred to; Jambavanta, Kalpa, Karshagni, Krityika, Lissingawa, Lotos, Meru, Mun, Naksitra, Naramedha, Pavaka, Pavana, Pikeswari, Polleur, Prithu, &c. &c.

As to these extravagant, and not always decent, tales of the Puranas, the probability is that physical or historical facts are thus connected under a veil of allegory, carried through a series of poetical narratives and adventures, related of the personified attributes of the Deity. The facts are either forgotten, or unknown to the vulgar; but the fables remain, and are generally and commonly alluded to in composition and conversation. Taken literally, as the translations of divine or holy perfections, nothing (bathing the invention, imagery, and other poetical merits) can be more contemptible than these Puranic romances; but if we deire to extract the grains of ore that the mass may probably contain, we must be content to examine them as they are; and in case of failure, many inquisitive researchers will deem their labour not lost, in the invention and other poetical beauties abounding in these wild compositions.

We shall briefly give an abstract of the contents of two or three of the Puranas, whence a judgment may be formed of the others. The Agni Purana is entitled to have been delivered by Agni, or Pavaka, the god of fire. (See Pavaka.) It contains a great variety of subjects, and seems to have been intended as an epitome of Hindoo learning. The poem opens with a short account of the several incarnations of Vishnu, an enumeration of which, with a brief outline of their history, will be found in the article Vishnu of this work, and these thence referred to. It dwells, however, chiefly on the incarnations of Krishna and Rama. (See these articles.) Then follow a history of the creation; a tedious dissertation on the worship of the gods, with a description of their images, and directions for constructing and setting them up; a concise description of the earth, particularly of those places which are esteemed holy, with the forms of worship to be observed at them; a treatise of astronomy, or rather astrology; a variety of incantations, charms, and spells, for every occasion. One species of this is named mantra, under which article a sufficient account is given of them; computations of the periods called manvantara, kalpa, &c. (See Karpaka.) A description of the several religious modes of life called asrama, and the duties to be performed in each; rules for penance (on this head see Tapas); feats and fables to be observed throughout the year; rules for bestowing charity; a dissertation on the great advantages to be derived from the mystic word OM (under which article of this work the reader will probably find sufficient of mysticism), with a hymn to Varistha, of whom something occurs under that article. The next head relates to the office and duties of princes; under which are given rules for knowing the qualities of men and women; for choosing arms and ensigns of royalty; for the choice of precious stones; and a treatise on the art of war. The next head treats of worldly transactions between man and man, as to buying and selling, borrowing and lending, giving and receiving, &c. &c. Then follow certain ordinances, according to the Veda, respecting security from misfortunes, &c. and for the worship of the gods. Genealogies of the two races of solar and lunar kings, called Suryavansha and Chandravansha (see Surya); of the family of Yadu and of Krishna, with a short history of the twelve years' war, described in the Mahabarat. (See Mahabarat.) A treatise on the art of healing, as applicable to man and beast, with rules for the management of elephants, horses, and cows; charms and spells for curing various disorders; and the mode of worshipping certain divinities; on the letters of the Sanscrit alphabet; on the ornaments of speech, as applicable to oratory, poetry, and the drama; on the mystic signification of the single letters of the Sanscrit alphabet; a grammar and short vocabulary of that language. The whole of this defulatory work is divided into 353 short chapters.

The Siva Purana is sometimes called also, after one of the forms of his comfort, the Kalika Purana. (See Kalasa.) It is a mythological history of that goddes, including her adventures under various names and characters. Many of those names and characters are enumerated under the article Parvati, her more common name; and Mr. Moor has given an extract under Narindeha, which word means a man-sacrifice, the rites and ceremonies of that horrid offering being minutely laid down in this Purana. It is a curious and entertaining work, including as episodes several beautiful allegories, particularly one founded on the motions of the moon. See Moor's Hindu Pantheon.

The Vayu Purana, as one of those poetical romances is variously called, but which we have not the means at this present moment of ascertaining is attributed to the regent of wind Vayu, otherwise and more commonly called Pavana (see Pavaka); where the reason is furnished why the Purana is not called after that name. It contains, among a variety of other curious subjects, a circumstantial detail of the creation of all things, celestial and terrestrial, with the genealogy of the first inhabitants; chronological computations as to the grand periods manvantara, kalpa, &c. before spoken of; a description of the earth, as divided into islands, continents, &c. and its dimensions, and also of other planets and fixed stars, their distance, circumference of orbits, &c. &c. Under the article Pavaka, an extract is given from the Matyva Purana, directing how images or pictures are to be made of the god of wind. Most of the Puranas contain directions of that sort.

A brief notice of one other of these inspired works will suffice. The Nareda Purana is believed to have been delivered by the inspired Nareda, a mythological son of Brahma. Under the article Nareda, (see Hindu Pantheon) an account is given of him, with his genealogy, and the derivation of his name, from the Varaha Purana. Like the others, this poem opens with describing how heaven and earth rose out of chaos, but it treats principally of the unity of God, and as it spectrally is written with the Vaihnavia bias (see Vaih-
Pur, trigono-

Ferrara cardmal alfo in As (See was This mufl improve am he all and He on Mr. Geography, in attend improper the grammarian, effect kAva), Other ferver, in the proofs aiks clufxon could facts, defcefTor longer they to fubjecl they to the proofs were ever sufted to the public ; and whatever they were, they have not wrought conviction on the minds of all. Mr. Colebrooke, however, (Af. Ref. vol. v.) leaves us to infer that he thought them very inferior in point of antiquity to the age assigned them by his illustrious predecefor in the chair of the Asiatic Society. Mr. Wilford expressly says, that "the Puranas are certainly a modern compilation from valuable materials, that I am afraid no longer exit: an astronomic obervation of the heliacal rising of Canopus, mentioned in two of the Puranas, puts this beyond doubt." (Af. Ref. vol. v.) Mr. Bentley, after giving various reafons and calculations for the foundation of his opinion, says, "It must be evident that none of the modern romances, commonly called the Puranas, at leaft in the form in which they now fland, are older than 684 (now 1813, about 600 years), but that none of them are the compilations of ill later times." (Ib. vol. viii.) As far, indeed, as the eighteenth Purana, called Sri Bhagavat, is concerned, Mr. Colebrooke countenances Mr. Bentley's opinion. "I am inclined," he says, "to adopt an opinion supported by many learned Hindoos, who confider the celebrated Sri Bhagavata as the work of a grammairian, supffed to have lived about 600 years ago." Ib. (See Sri Bhagavat.) Be this as it may, the orthodox Hindoos have implicit faith in, and great veneration for, those celebrated poems, or " sacred histories," as they call them; and it is authoritatively aflemed, that "the Veda, the revealed fystem of medicine, the Puranas, and the code of Menu, are four works of supreme authority, which ought never to be shaken by arguments merely human. (See Menu.) There are, however, many individuals of all the four tribes of Hindoos, fewest certainly in that of Brah- mana, who correcpond with the Levites of Israel, who deny the divine origin of the Puranas, looking upon them in nearly the fame light as a rational critice of Europe may do.

Purangurrah, in Geography, a town of Bengal; 20 miles S.E. of Dhahabad.

Purari, a name of the Hindoo deity Siva; which see.

Purary, a name of the Hindoo deity Siva; which see.

Purbach, George, in Biography, an eminent mathematician and afebmon in the 15th century, was born at Purbach, a town on the confines of Austria and Bavaria, in 1423. He was educated at Vienna, where he manifested great talents, and took his degree of M.A. with great applause. He directed his attention principally to mathe- matics, and advanced in that science with almost incredible rapidity. For farther improvement, he visited the most cele- brated universities of Germany, France, and Italy. He found a particular friend and patron in cardinal Cusa, and he formed an intimacy with John Blanchini of Bologna, who adoring Purbach's extensive knowledge, and his ready method of communicating instruction, wished to pre- vail upon him to deliver lectures on astronomy at Ferrara; but Purbach preferred returning to Vienna, where he ob- tained the mathematical professorship in that university. About this time he received offers from Ladislaus, king of Hungary, to become his astronomer, accompanied with promises of liberal rewards and distinguished honours, which he declined.

The fame of Purbach, as a mathematical professor, was soon widely diffused, and brought numerous students to attend his lectures at Vienna. Among others was the celebrated Regiomontanus, who feured the esteem of his master, and was chosen the affiliant and companion in his labours. From this time they maintained an union of studies, in their endeavours to improve the different branches of mathe- matical science, and more particularly astronomy. This science they would, no doubt, have materially improved by their joint labours, had Purbach's life been prolonged. His first effay was to amend the Latin translation of Pto- lemy's Almagest. After this he wrote "An Introduction to Arithmetic," and proceeded to draw up another "On Gnomonics," or dialling, with tables suited to the difference of climates and latitudes. This was followed by a small tract "Concerning the Altitudes of the Sun," with a table, and "Astralabic Canons." After this he made solid spheres, or celestial globes, and not only explained their construction and uses, but added to them a new table of fixed stars, with the longitude by which every star had increa- sed, from the time of Ptolemy to the middle of the fifth century. He also invented various other instruments, among which was a "gnomon," or geometrical square, with canons, and a table for the use of it, which he lent to the archbishop Strigonia, who was himself a man of great erudition, and entertained a high opinion of Purbach. Our author made considerable improvements in trigono- metry; prepared tables of the fixed stars, and undertook to reform thofe of the planets, and constructed fome entirely new ones. When these tables were finished, he drew up a kind of perpetual almanack, chiefly for the moon, anfwer- ing to the periods of Meton and Calippus: also an alman-ack for the planets, or, as it was afterwards called, an Ephemeris for many years. He finifhed his "Theorie Novae Planetarum," (see Muller,) which was made a textbook in all the schools, and was commented upon by none of the moft eminent mathematicians. Purbach died in the 38th year of his age, in 1461.

Purbeck, Isle of, in Geography, a district in the Blandford division of the county of Dorset, England, is bounded on the west by Luckford lake; on the south by the British channel; and on the other side by the river Frome, and the bay of Pool. It is improperly called an iland, being in fact only a peninsula, as it may be entered from Earl Lilworth by an isthmus, between the head of Luckford lake and the sea. This district extends twelve miles in length, and varies from seven to ten in breadth. It
Purbeck Stone, the *fassum arenarium cinereum Purbeckense* of Da Costa, and *psalterium friabile albido fuscem* of Hill, is an alkaline sand-flone, which is hard and rough, of a disagreeable ahen colour, very heavy, and moderately hard, of a texture not very compact, but somewhat porous, and is composed of an angular grit, cemented together by an earthy spar: it cuts freely, and with a tolerable even or smooth surface, but will not take a polith. It will not strike fire with a flint, and burns to a white colour. The quarries of this flone are in the island of Purbeck, in Dorsetshire, whence it is brought to London in great quantities, and used in building, and for pavements. Its specific gravity is 2.68. There is also another kind of Purbeck flone, the *fassum fusco-albidum* of Da Costa, and the *sympsoium durifimum, splendidum albido-fusoeum* of Hill, which is alkaline, of a dull, disagreeable, pale, brownish, white colour, and is not capable of a polith, though it cuts to a very smooth surface: it is of a fine, close, compact texture, not quite deftitute of brilli-
ness, but full of spars of pure spar, and intimately mixed with vast quantities of small pectunculi, which are often faturated and filled with the fame substance; it is very heavy and hard, and water does not pervade its texture; it does not strike fire with a flint, and when burnt, acquires a clear ahen colour. This flone is brought from Purbeck, and used in building, pavements, &c. Hill informs us, that it is likewise found in man y other parts of the kingdom, and that there are large flates of it in Yorkshire. Da Costa's *Fossils*, p. 128–152.

Purbury, in Geography, a river of Hindoostan, which runs into the Chambul; seven miles W. of Suito-
pour, in the country of Agimere.

Purcar, a town of European Turkey, in Beffaria, on the Dniefer; 4 miles S.E. of Bender.

Purcell, Henry, in Biography, an English musician of more extensive genius than perhaps our country can boast at any other period of time, was born in 1659. His father, Henry, and uncle, Thomas Purcell, were both musicians, and gentlemen of the chapel royal, at the restoration of king Charles II. There is a three-part song in Playford's "Musical Companion," by Henry Purcell, which, being printed in 1667, when our great musician was but nine years old, must have been the production of his father. There is likewise a chant in the first volume of Boyce's *Collection*, p. 289, No. II, called the "burial chant," by Thomas Purcell, his uncle, who continued in the service of the chapel till the time of his death, in 1682. Though these compositions promise no great hereditary genius, they are mentioned here, as mankind is naturally curious concerning every thing that is connected with eminent person.

From whom Henry received his first instructions in music, cannot be very clearly ascertained. But his father dying in 1664, when he was no more than six years old, it is probable he was qualified for a chorister by Capt. Cook, who was master of the children from the restoration till the time of his death, in 1672. For, as Purcell was appointed organist of Westminster Abbey at eighteen years of age, he must have learned the elements of his art before his fourteenth year, at which time Pelham Humphrey, brought up in the royal chapel under Capt. Cook, was appointed his successor, as master of the boys. Purcell certainly continued to sing in the king's chapel, and to receive lessons from Humphrey till his voice broke, an accident which usually happens to youth at sixteen or seventeen years of age: after this, perhaps, he had a few lessons in composition from Dr. Blow, which were sufficient to cancel all the instructions he had received from other masters, and to occasion the boast inscribed on the tomb-stone of Blow, that he had been

"Master to the famous Mr. Henry Purcell."

But there is nothing more common than this petit larceny among musicians: if the first master has drugged eight or ten years with a pupil of genius, and it is thought necessary, in compliance with fashion or caprice, that he should receive a few lessons from a second, he infantly arrogates to himself the whole honour, both of the talents and cultivation of his new scholar, and the first and chief instructor is left to fingo, sic vos non vocis.

Purcell is said to have profited so much from his first lessons and clope application, as to have composed, during the time of his being a finging boy in the chapel, many of his anthems, which have been constantly sung in our cathedrals ever since. Eighteen was a very early age for his being appointed organist; that is, maestro di capella of Westminster Abbey, one of the first cathedrals in the kingdom for choral compositions and performance. It was not likely he would stop here: the world is, perhaps, more partial to promising youth than accomplished age; and at twenty-four, in 1682, he was advanced to one of the three places of organist of the chapel royal, on the death of Edward Low, the successor of Dr. Christopher Gibbons, in the same station.
After this, he produced so many admirable compositions for the church and chapel of which he was organist, and where he was sure of having them better performed than elsewhere, that his fame was soon extended to the remotest parts of the kingdom.

From this time, his anthems were eagerly procured, and heard with pious rapture wherever they could be performed; nor was he further long to devote himself totally to the service of the church. He was, very early in life, solicited to compose for the stage, and chamber, in both which undertakings he was so superior to all his predecessors, that his compositions seemed to speak a new language; yet, however different from that to which the public had been long accustomed, it was universally understood. His songs seem to contain whatever the ear could then wish, or heart could feel.

We have been assured by a very good judge of music, who was nineteen years of age when Purcell died, and remembered not only his person very well, but the effect which his songs had on himself and the public at that time, when many of them were first heard; and used to say, that "no other vocal music was listened to with pleasure, for near thirty years after Purcell's death; when they gave way only to the favourite opera songs of Handel."

The unlimited powers of this musician's genius embraced every species of composition that was then known, with equal felicity. In writing for the church, whether he adhered to the elaborate and learned style of his great predecessors Tallis, Bird, and Gibbons, in which no instrument is employed but the organ, and the several parts are constantly moving in fugue, imitation, or plain counterpoint; or, giving way to feeling and imagination, adopted the new and more expressive style of which he was himself one of the principal inventors, accompanying the voice-parts with instruments, to enrich the harmony; and even the melody and meaning of the words, he manifested equal abilities and resources. In compositions for the theatre, though the colouring and effects of an orchestra were then but little known, yet as he employed them more than his predecessors, and gave to the voice a melody more intercelling and impassioned than, during the seventeenth century, had been heard in this country, or perhaps in Italy itself, he soon became the darling and delight of the nation. And in the several species of chamber music which he attempted, whether fantasias for instruments, or odes, cantatas, songs, ballads, and catches for the voice, he so far surpassed whatever our country had produced or imported before, that all other musical productions seem to have been instantly configned to contempt or oblivion.

As many of his numerous compositions for the church, particularly those printed in the second and third volumes of Dr. Boyce's Collection, are still retained in the king's chapel, and in our cathedrals, we shall here acquaint the musical reader in what manner we have been affected by some of these productions, in a late attentive perusal of them.

It appears by Dr. Bayley's "Collection of the Words of Anthems used in his Majesty's Chapel Royal," that ten of Purcell's are still performed there; and in the late Rev. Mr. Mafon's "Copious Collection of the Words of such Anthems as are used in the Cathedral of York," that nearly twenty of his choral compositions are still sung in that choir.

Purcell's four-part anthem, "O God, thou art my God," (Boyce's Collection, vol. ii. p. 148.) must certainly have been one of his juvenile productions, before he had sufficiently refined his ear, or exercised his judgment; as there are many crude harmonies, and false accents in it, which in riper years he would not have tolerated.

Of his six-part anthem, "O God thou hast called us out," the first movement, in which there are many bold harmonies, is extremely elaborate, yet spirited and pleasing. The verse, "O be thou our help," is not only full of new and fine effects, but touching. By those who object not to the confusion in the words which arises from fugue and imitation, while the several parts are singing different portions of the same sentence, at the same time, the words will appear perfectly well accented and expressed.

The first movement of his full anthem in eight parts, "O Lord God of hosts," is a noble composition, alla Pura_ lifrma, in which all the laws of fugue are observed, and sometimes more, subjects, are preferved inviolate; the harmony, though bold, is, in general, chaste, and the effect of the whole spirited and majestic. The second movement is extremely pathetic and expressive; but, both in that and the last movement, he seems trying experiments in harmony; and, in hazarding new combinations, he seems now and then to give the ear more pain than pleasure.

The two-part anthem, "Thy way, O God, is holy," continues to be excellent music still, in the flow movements; the quick, however, seems somewhat antiquated, and the melody to these words, "the air thunders," &c. seem too light and dramatic for the church at any period.

The three-part anthem, "Be merciful unto me, O God," is admirable throughout. Indeed, to our conceptions, there seems no better music existing, of the kind, than the opening of this anthem, in which the verse, "I will praise God," and the last movement, in C natural, are in melody, harmony, and modulation, truly divine music.

The complete service of Purcell, in B flat, printed by Boyce, is a most agreeable and excellent piece of counterpoint, of which the modulation frequently stimulates attention by unexpected transitons, yet so softly a kind as never to give the ear the least uneasiness, till we come to the bottom of p. 170, and then the fame crudities of the sharp 3d and flat 6th, and flat 3d, 4th, and 5th, which we have already conferved in the works of Mr. Blow; which we hope, in spite of our partiality for Purcell, the organists of our cathedrals confpire not to change for better harmony.

These two or three combinations, like some words and phrases which Shakspear tried unsuccessfully to render current, have been rejected by posterity; and it is in vain to attempt at forcing them upon the public by the mere weight of authority. The ear will patiently bear very rough usage from an artist who in general makes it such ample amends; however, there are limits, beyond which it is unsafe to excrete cruelty of all kinds; and the auricular sense will be deadened, disguised, or rendered indifferent to music's powers, by too harsh treatment.

The "Benedicium," as well as "Te Deum," and all the rest of the service, must be extremely pleasing, in all other respects, to every ear sensible to harmony. The words are, in general, accented with great accuracy (except the contracting high f into a monolyllable, to which only one note is given); and the few points of imitation are fragments of agreeable melody. In p. 121 of Boyce's, the A♭ and A♭, at the word befree, in the Kyrie, are peculiarly beautiful, as are the 3rd with the 6th at "before all worlds," in the creed, and the close at "whom all things were made." The point at "throughout all generations," in the Magnificat, is what the Italians call ten tirato, well-worked. In the last line, however, of page 122, so many exceptional combi-
nations occur, that we cannot pass them over without a digma. Yet, upon the whole, the abilities of Purcell, as a profound contrapuntist, appear perhaps more in the course of this service than elsewhere; as he has manifested deep study and meditation in a species of writing to which it was not likely that his creative and imaginative genius would submit, having had the patience, as well as abilities, to enrich it with no less than four different canons, of the most difficult construction, as of two, three, and four in one, by inversion.

The superior genius of Purcell can be fairly estimated only by those who make themselves acquainted with the state of music previous to the time in which he flourished; compared with which, his productions for the church, if not more learned, will be found infinitely more varied and expressive; and his secular compositions appear to have descended from another more happy region, with which neither his predecessors nor contemporaries had any communication.

Besides the whole service, with three full, and six verse anthems, in Dr. Boyce’s Collection, there are nine verse and full anthems, wholly different, still sung in the cathedral at York. And in Dr. Tudway’s Collection, Britis Mufeum, there are besides a whole service in B flat, different from that in Boyce, eight full and verse anthems, different from all the rest, four of which were composed for the chapel royal of Charles II., and are accompanied with instruments. And still, exclusive of these and the hymns printed in the two books of “Harmonia Sacra,” in a manuscript bequeathed to Chrift-church college, Oxon, by Dr. Aldrich, there are two motets, and a “Gloria Patri” for four and five voices, in Latin, with seven psalms and hymns for three and four voices, by our fertile and diligent composer, that have all their peculiar merit, but of which some may, without hyperbole, be said to reach the true sublime of sacred music.

To enter into a minute examination of these, and his admirable Te Deum and Jubilate, composed for St. Cecilia’s day, 1694, would extend this article to too great a length; though they merit much praise as well as critical remark; for which, on the Te Deum we refer our readers to the ample account of him and his works, in Burney’s History of Music, vol. iii.

Purcell’s theatrical compositions, if we collect the number and excellencies of his productions for the church, and the shortness of his life, will surprise by their multiplicity as well as singular merit. Of those dramas which are called operas, and of which music and decorations were the principal allurements held out to the public, a detailed account is given in speaking of the origin and progress of the musical drama in England, previous to the use of the Italian language, music, and performers on our lyric stage. (See Masques, and Matthew Locke.) And of Purcell’s detached and incidental songs, dialogues, and scenes that were performed at our national theatre, or playhouse, the principal will be mentioned in speaking of his “Orpheus Britannicus,” or posthumous collection of his miscellaneous compositions. But before we enter on an examination of this work, it seems necessary to acquaint the reader, that the chief part of his instrumental music for the playhouse is included in a publication that appeared two years after his decease, under the title of “A Collection of Ayres composed for the Theatre, and on other Occasions, by the late Mr. Henry Purcell.” London, printed for Frances Purcell, Executrix of the Author, 1697.” These airs are in four parts, for two violins, tenor and bass, and were played as overtures and aét-tunes in our own memory, till they were superseeded by Handel’s hautbois concertos, and those, by his overtures, while Boyce’s sonatas, and Arne’s compositions, served as aét-tunes. In process of time these were supplanted by Martini’s concertos and sonatas, which were thrown aside for the symphonies of Van Maldere, and sonatas of the elder Stamitz. About this time, the trios of Campioni, Zanetti, and Abel, came into play, and then the symphonies of Stamitz, Canabich, Holtzbauder, and other Germans, with those of Bach, Abel, and Giardini; which, having done their duty many years very pleasantly, “slept with their fathers;” and at present give way to Vanhall, Boccherini, Haydn, and Pleyel. “Sic transit gloria mundi corum!”

Purcell seems to have composed introductory and aét-tunes to most of the plays that were brought on the stage during his time. The publication of these, in four parts, contains his music to the following dramas:

“Abelazer,” 1677. The music of this consists of an overture, and eight airs or tunes.


“The Infamy Queen.” The first movement of this overture is equal to any of Handel’s. There are likewise two or three trumpet-tunes, well calculated for the instrument, and a rondcado at the end, which would now seem new, if played in a concert by a good hand.

“Dioclesian, or the Prophets,” 1690. The instrumental music of this English opera given here, consists of an overture of two movements, the first excellent in the style of Luilli, and afterwards of Handel, with better fugues; prelude, accompaniment to a song, trumpet-tune, air, hornpipe, country-dance, and canaries.


“Amphitrition,” 1691. Overture and eight tunes.

“Gordian Knot untied,” 1691. Overture and seven tunes.

“Dilfressed Innocence, or the Princess of Persia,” 1691. Overture and seven tunes, all proofs of the author’s original genius.

“The Fairy Queen,” 1692. Two overtures and sixteen tunes of different kinds. No 1, an air, 4 in 2, is a very curious canon on two subjects; the first treble and bass performing one, and the second and tenor the other. There is as much accent and spirit in this composition, as if it were in free counterpoint.

“The Old Bachelor,” 1693. Overture and eight tunes.

“The Married Beau,” 1694. Overture and eight tunes, among which is a very agreeable air for the trumpet, a march, and a hornpipe, that are characteristic. This last is very much in the style of a Spanish fandango.


“Bondouca,” 1695. Overture and eight tunes, including “Britons strike home,” and “To arms,” in four parts.

These are the contents of this posthumous publication; but besides the music for these dramas, he composed overtures, aét-tunes, and songs, for “Timon of Athens,” 1678; for “Theodorus, or the Force of Love,” 1680; for Dryden’s “Tempest,” 1690; and for “Don Quixote,” 1694.

But few of Purcell’s single songs seem to have been printed during his life. He published the music to a masque sung in the tragedy of “Oedipus,” when it was revived in 1692. And “a musical entertainment,” performed Nov. 22, 1684, on St. Cecilia’s day, printed in score by John Playford, with a dedication to the gentlemen of the musical society, and particularly the stewards, written by Henry Purcell, composer of the music.”

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There are several of his songs in Playford's Collection, called "The Theatre of Music, 1687, fourth and last Book," and though these are not in his best manner, they are more original and interesting than the rest. Among these, p. 55, "A new song to a Scotch tune," by our author, feems to us more pleasing and lafs than any of the Scotch tunes, or imitation of the national melody of the northern inhabitants of this island, that has been fine produced.

Page 62 of the same Collection, there is an admirable piece of recitative, in a truly grand style: "Amidst the shades," &c. But the collection of his peculiar vocal music, which did him the greatest honour, and long rendered his name dear to the British nation, was published by his widow two years after his decease, by the title of "Orpheus Britannicus." Here were treasured up the songs from which the natives of this island received their first great delight and imprefion from the vocal music of a fingle voice. Before that period we had cultivated madrigals, and fongs in parts, with diligence and fuccefs; but in all fingle fongs, till those of Purcell appeared, the chief effects were produced from the words, not the melody. For the airs, till that time, were as unformed and mis-shaped, as if they had been made of notes scattered about by chance, instead of being call in an elegant mould. Exclusive admirers of modern symmetry and ealeance, may call Purcell's tale barbarous; yet in spite of superior cultivation and refinement, in spite of all the vicifitudes of fashion, through all his rudeufes and barbarism, original genius, feeling, and passion, are, and ever will be, discoverable in his works, by candid and competent judges of the art.

To this admirable collection are prefixed seven copies of verses to his memory, at the head of which is an ode, written on his death, by Dryden, which was set by Dr. Blow, and performed at the concert in York Buildings.

There are few songs in the "Orpheus Britannicus," but what contain some characterific marks of the author's great and original genius. The melody, however, will at first feem to many at present uncouth and antiquated; but by a little allowance and examination, any one pofteed of a great love for music, and a knowledge of our language, will feel, at certain places of almost every song, his unfuperior felicity and passion in expressing the poet's fentiments which he had to tranflate into melody.

The favourite songs with Purcell's admirers in our youth, were the following; and upon a late attentive perusal of the book, they feem to have meritcd particular diftinction. "Cela has a thousand charms": the firft movement of this, like many of Purcell's fongs, feems only reactiva graced, or embellifhed with the fashionable volute, or flourifher of the times, which are now as antiquated as the curls of his own perrue, or the farbells and flows of queen Elizabeth. The second movement, however, of this fong, is plainfiant and graceful; and at "I should my wretched, wretched, fate deplore," is still new and pathetic.

"You twice ten hundred duties," opens with what feems to us the bleft piece of reactiva in our language. The words are admirably effracted throughout this fong, by modulation as well as melody. And there is a proprity in the changes of movement, which does honour to Purcell's judgment, as much as the whole composition to his genius. The change of style and sluggish motion given to the notes at these words, "from thy fleeping mantie rife," is a model of musical imitation and expression. The modulation is flill fo excellent, that the best modern mafters are obliged to adopt it on many of its great occasions.

Of the music to "King Arthur" we fhall say but little, as it has been lately revived, well performed, and printed. If ever it could be faid with truth of a compofitor, that he has deve\ nce fe\ ce, outstrip his age, Purcell is entitled to that praise; as there are movements in many of his works which a century has not injured, particularly the duet in King Arthur, "Two daughters of this aged stream," and "Fairest isles all isles excelling," which contain not a fingle passage that the bleft compofers of the preient times, if it prefted itself to their imagination, would reject. The dialogue in the "Prophetefi," "Tell me why, my charming fair," is the moft pleasur and ingenious of all the compositions of the kind which the rage of fashion produced during the five epoches. The firft part of "O lead me to some peaceful gloom," is truly elegant and pathetic." From rose bow's," is faid to have been set in his lail sicknels, at which time he feems to have realized the poetical fable of the fwan, and to have lung more fweetly as he approached nearer his dilfolution; for it feems to us as if no one of his productions was fo elevated, fo pleasing, fo expressive, and throughout fo perfect, as this. The variety of movement, the artiful, yet touching modulation, and, above all, the exquisite expreffion of the words, render it one of the moft affecting compositions extant to every Englishman who regards music not merely as an agreeable arrangement and combination of sounds, but as the vehicle of sentiment, and voice of passion.

There is more elegant melody, more elaborate harmony, more ingenious contrivance, in the motion and contexture of the several parts than in the works of many great compofers; but to the natives of England, who know the full power of our language, and feel the force, spirit, and shades of meaning, which every word bears according to its place in a fentence, and the situation of the speaker, or finger, we must again repeat it, this composition will have charms and effects, which, perhaps, Purcell's music only can produce.

"When Mira sings," is a duet that will ever be captivating, as long as the words remain intelligible; of which he has augmented the force, particularly at the end, by notes the moft felect and expressive that the musical scale can furnish.

"Loft is my quiet," another duet, which fills lives. And "Celebrate this festival," a birth-day fong for queen Mary, which is graceful and pleasing through all its old-fashioned thoughts and embellishments. "I'll fall upon the dog-star," has all the fire of Handel's prime.

"Mad Befs" is a fong, or rather a cantata so celebrated, that it needs no panegyric, or renewal of public attention, as every captivating English singer in our memory has revived its favour. The firit Mrs. Sheridan and Mrs. Bates never gave more exquisite delight by their admirable performance, than when they regarded their friends with this song. Beard, forty years ago, used to acquire great applause by finging Purcell's "Rody Bowes;" and Pafi, by her performance of "Mad Befs," in the concerts at Hichford's rooms, the Caflc, and Swan concerts, where Stanley was justly admired for his ingenious and masterly manner of accompanying them. "The Nature's Voice," is an enigmatic fong, seemingly on nature, in which Purcell has crowded all the fashionable passages of taste and vocal difficulties of the times. Indeed, he feems to have anticipated many fantastical feats of execution and articulation in which great performers have since raved; and this is the more wonderful, as the Italian opera was not eftahlished, or even attempted here, during the life of Purcell; whose decease preceded the arrival of Valentiini and Niccoli, the first great fingers imported from Italy, at leaft ten years.
"Blow, Boreas, blow," was in great favour, during our youth, among the early admirers of Purcell; but this seems now more superseded than any of his popular songs.

"Let Caesar and Urania live," was a duet in a birdbath ode, during the reign of King William and Queen Mary, which continued so long in favour, not only while those sovereigns jointly wielded the sceptre, but even when George III. had left his royal comfort, and there ceased to be a queen, or Urania, for whom to offer up prayers, that Dr. Green, and afterwards Dr. Boyce, used frequently to introduce it into their own and the laureate's new odes. This duet, like many other productions of Purcell, was built on a ground-bafe of only two bars, which are invariably repeated to different passages of the voice-parts that are in harmony with it, throughout the movement. The latter part of this duet is extremely beautiful, and does not seem at all to have suffered from the voluntary restraint under which the composer laboured.

The composing fongs on a ground-bafe, was an exercise of ingenuity, in which Purcell seems to have much delighted; but though it was as much a fashion in his time, as the composing madrigals on the subject of old tunes in the days of Jefquin, and variations upon those tunes in the days of Bird and Dr. Bull, in which they all manifested superior abilities, yet the practice was Gothic, and an unworthy employment for men poifelled of such genius and original resources. The Italians started this, as well as most other musical fashions; for it appears by the works of Tranquillo Merula, published 1635, that writing upon a ground-bafe was a favourite occupation with that capricious composer, as well as our ingenious countryman.

Judges of musical design, modulation, and expression, will meet with many places to admire in songs that have never been popular, yet have local beauties, and mark the superior powers of the composer; particularly in the "Signs for the death of King Charles II." In the "Dialogue in tyrannic Love," p. 158, there is a passage upon which the late Mr. Bach has constructed a favourite movement in one of his Quartets concertati.

"I attempt from love's sickness," is an elegant little ballad, which, though it has been many years dead, would soon be recalled into existence and fashion, by the voice of some favourite finger, who should think it worth animation.

"Let the dreadful engines!" this is the last song in the first volume of the "Orpheus Britannicus," of which, though both the words and music of the first movement are wild and bombast, yet the second and last differ o more for the graceful comic, as well as the tender and sublime fable of composition; and there are several passages in this cantata sufficiently gay and new for a modern burletta.

In 1702, a second, and more correct, edition, of the first volume of this work was published, with more than thirty songs that were not in the first impression; but, in order to make room for which, some of the former were excluded.

The fame year was likewise published a second volume of "Orpheus Britannicus," by Henry Playford, which he dedicated to the earl of Halifax. The song of this second volume, p. 4, beginning, "Ah! cruel nymph!" has great ingenuity in the first movement, and grace in the second. And the next air, "Crown the altar," seems the most pleasing of any that he has composed on a ground-bafe. "May the god of wit inflire," for three voices, is natural and pleasing, and the echo in the second part are very ingeniously contrived.

"Thus the gloomy world," accompanied with the trumpet, and violin alternately, is masterly, and well designed to display the truest and most brilliant tones of the trumpet, though but little is given to the violin, which so much better deferves employment, than an instrument of such false intonation as the trumpet.

Those that can relish good music of every age and country, and have no exclusive partiality to individuals of either, will find amusement in the performance or perusal of Purcell's "Four Seaons," in the "Fair Queen," which comprehend merit of various kinds.

"To arms, to arms," is an admirable military song, accompanied by a trumpet, which is so confined an instrument, that nearly the fame passages must be used in all ages, so that time has robbed this song of but little of its novelty. Indeed, the divisions of this air have been revived of late years, and are now as fashionable, in frivolous and unmeaning melody, as ever.

There are many excellent fongs in this volume; however, these and their peculiar beauties we must pass over, or our commentary will encroach too much on the limits of our biographical articles, as well as on the time and patience of those readers to whom the name and productions of our British Orpheus are alike unknown or indifferent. Yet we must observe, that there is a composition in Purcell's "Bac-
ducea," in which he has anticipated a species of dramatic music, which has been thought of late invention; the words are "Hear ye gods of Britain!" he has put in an accompanied recitative, a tempo, or aria parlante. The beginning, however, with the bass à pedale, has the true characteristic of recitative. Afterwards, when the bass is put in motion, the whole has the properties of an air, ingeniously and spirituallly accompanied by two violins and a base. Besides the true dramatic call of this composition, there are new harmonies hazarded, which we do not recollect having seen in anteror contrapuntials, at least of our own country.

We dare proceed no further in analyzing the works of our illustrious countryman, though it would afford us great pleasure, as we never look at them without seeing a merit very superior to that of any of his contemporaries out of Italy, and even there, only the vocal compositions of Carissimi and Stradella seem to surpass them in grace and elegance. Carissimi appears to have been his model in his bell recitatives, and Lulli in the world; and it is manifest that he was fond of Stradella's manner of writing, though he never pillaged his passages.

We must not quit his vocal music without an honourable and grateful memorial of his catches, rounds, and glees, of which the humour, ingenuity, and melody, were so congenial with the national taste, as to render them almost the sole productions of the facitious kind that were in general use for near four score years. And though the countenance and premiums bestowed of late years upon this species of composition, as well as modern refinements in melody and performance, have given birth to many glees, of a more elegant, graceful, and exalted kind, than any which Purcell produced; yet he seems hardly ever to have been equalled in the wit, pleafantry, and contrivance of his catches.

Of fifteen anthems, with symphonies and instrumental parts, with innumerable odes and miscellanies, we have room to say nothing, though much praise is due to many of them.

An abfund cufum prevailed in Purcell's time, which he carried to greater excels, perhaps, than any other composer, of repeating a word of one or two syllables an unlimited number of times, for the sake of the melody, and sometimes before the whole sentence has been heard. Such as no, no, no, —all, all, all, —pretty, pretty, pretty, &c. ad infinitum. But there is equal redundance and obscurity in the wfe which the Italians make at present of i, ii, iii, and ni, no, ni, in their fongs.

Purcell
PURCELL.

Purcell was so little acquainted with the unlimited power of the violin, that we have scarcely ever seen a becoming passage for that instrument in any one of his works; the symphonies and ricordanze to his anthems and songs being equally deficient in force, invention, and effect. And though his fantasias contain many ingenious, and, at the time they were composed, new traits of melody and modulation, if they are compared with the productions of his contemporaries, Corelli, they will be called barharous. But Corelli wrote for an instrument of which he was a great master: and who ever entirely succeeded in composing for one of which he was ignorant? When a great performer on keyed instruments confides to compose for the violin, upon which he has never been a good player, or the voice, without knowing in what good fingering conflits, the passages all come from the head, and none from the hand, except the hand of a harpichord player, which is ever unfit to suggest ideas either for a voice, or for any other instrument than his own. Such a composer for the violin must inevitably embarrass the player with perpetual awkwardnesses and difficulties without effect, which discover an utter ignorance of the finger-board.

If Purcell, by travelling, or by living longer at home, had heard the great instrumental performers, as well as great fingers, that arrived in this country soon after his decease, and had such to compose for, his productions would have been more regular, elegant, and graceful; and he would certainly have set English words better than it was possible for any composer to do, for our feelings, however great his genius, or excellent, in other respects, his productions. But Purcell, like his successor, Arne, and others who have composed for the playhouse, as always had an inferior band to the Italian opera composers, as well as inferior fingers, and an inferior audience to write for.

The diligent and candid Walcher, by not having afforded to Purcell a niche in his Musical Dictionary, feems never to have heard of his existence; but Purcell was so truly a national composer, that his name was not likely to be wafted to the continent; and the narrow limits of his fame may be fairly ascribed, not only to the paucity and poverty of his compositions for instruments, for which the musical productions are an intelligible language to every country, but to his vocal compositions being solely adapted to English words, which render it unlikely for their influence to extend beyond the foil that produced them.

We should, however, have known as little of Lulli, as the French or Italians of Purcell, but for the partiality which Charles II. acquired, by his long residence on the continent, for the arts and amusements of France. The first attempts at operas here, after the Restoration, were either in French, or on the model of those that were then in high favour at Versailles. And whoever is equally acquainted with the recitative, we had almost said the general melody of Lulli and Purcell, must perceive a strong resemblance. Purcell, however, having infinitely more fancy, and, indeed, harmonical resources, than the Frenchified Tufani, his productions now afford far greater pleasure and amuse- ment to a liberal lover of music, than can be found, not only in the productions of Cambert and Grub, whom Charles II. and to flatter his majesty, Dryden, patronized in preference to Purcell, but in all the noisy monotony of the rhapsodist of Quinault.

Let those who shall think Purcell has sacrificed the national honour by confounding his reverence for the productions of Italy, compare the peculiar productions of English musicians, from the death of queen Elizabeth to the year 1683, with those of Carissimi, Cesti, Stradella, and innumerable others of great abilities, and if they do not equally hate music and truth, they will admire Purcell's probity, as well as his genius.

Indeed, music was manifestly on the decline, in England, during the seventeenth century, till it was revived and invigorated by Purcell, whose genius, though less cultivated and polished, was equal to that of the greatest masters on the continent. And though his dramatic style and recitative were formed in a great measure on French models, there is a latent power and force in his expression of English words, whatever be the subject, that will make an unprejudiced native of this island feel, more than all the elegance, grace, and refinement of modern music if happily applied, can do. And this pleasure is communicative to us, not by the symmetry or rhythm of modern melody, but by his having fortified, lengthened, and tuned, the true accents of our mother-tongue; those notes of passion, which an inhabitant of this island would breathe, in such situations as the words he has to set deliberate. And these indigenous expressions of passion Purcell had the power to enforce by the energy of modulation, which, on some occasions, was bold, affecting, and sublime.

These remarks are addressed to none but Englishmen: for the expression of words can be felt only by the natives of any country, who seldom extend their admiration of foreign vocal music, farther than to the general effect of its melody and harmony on the ear; nor has it any other advantage over instrumental, than that of being executed by the human voice, like fallegri. And if the Italians themselves did not come hither to give us the true expression of their songs, we should never discover it by study and practice.

It has been extremely unfortunate for our national taste and our national honour, that Orlando Gibbons, Pelham Humphrey, and Henry Purcell, our three best composers during the last century, were not blest with sufficient longevity for their genius to expand in all its branches, or to form a school, which would have enabled us to proceed in the cultivation of music without foreign assistance.

Orlando Gibbons died 1625, at forty-four.
Pelham Humphrey died 1674, at twenty-seven.
And Henry Purcell died 1695, at thirty-seven.

If these admirable composers had been blest with long life, we might have had a music of our own, at least as good as that of France or Germany; which, without the assistance of the Italians, has long been admired and preferred to all others by the natives at large, though their princes have ufually foreigners in their service. As it is, we have no school for composition, no well-digested method of study, nor, indeed, models of our own. Instrumental music, therefore, has never gained much by our own abilities; for though some natives of England have had hands sufficient to execute the productions of the greatest masters on the continent, they have produced but little of their own that has been much esteemed. Handel's compositions for the organ and harpsichord, with those of Scarlatti and Alberti, were our chief practice and delight for more than fifty years; while those of Corelli, Geminiani, Albinoni, Vivaldi, Teffarin, Vercini, and Tartini, till the arrival of Giardini, supplied all our wants on the violin, during a still longer period. And as for the hautbois, Martinu and Fisler, with their scholars and imitators, are all that we have listened to with pleasure.

If a parallel were to be drawn between Purcell and any popular composer of a different country, reasons might be assigned for supposing him superior to every great and favourite contemporary musician in Europe.

Carissimi and Stradella, if more polished in their style, were certainly less varied, and knew still less of instruments, than
than our countryman. They had both, perhaps, more grace and regularity, but infinitely less passion and fire.

The elder Scarlatti was more rieberché and learned, but never so natural and effecting.

In Germany, if Keifer, during an active and much longer life, surpassed him in the number and excellence of his dramatic compositions, his productions for the church, could they be found, would, we believe, bear no comparison.

Lulli, both in his manner and in his productions, composed also more operas than Purcell, and was the idol of the nation for which he laboured; but though his overtures long served as models, even to Purcell, as well as to the composers of all the rest of Europe, and his music was performed by better fingers, and a more numerous band, supported by the patronage of a court, and all the splendour of ingenious and costly exhibition; it is easy to see that even his theatrical works are more monstrosities, monotonous, and uninteresting in themselves, than those of Purcell; but in relinquishing the stage, and stepping on holy ground, we should have found, even in France, during all his glory, and the enthusiasm he raised, none of his votaries who would attempt to put his sacred music in comparison with that of our countryman.

Rameau, the successor of Lulli in court and popular favour, and who had more learning and theoretical knowledge in the art, than perhaps any practical musician of modern times; yet, in pathos and expression of words and the passions, he was Purcell's inferior, even upon the stage; and in the church, he had no claim to celebrity.

Handel, who flourished in a less barbarous age for his art, has been acknowledged his superior in many particulars; but in none more than the art and grandeur of his choruses, the harmony and texture of his organ fugues, as well as his great style of playing that instrument; the majesty of his hautbois and grand concertos, the ingenuity of the accompaniments to his songs and choruses, and even in the general melody of the airs themselves; yet in the accent, passion, and expression of English words, the vocal music of Purcell is, sometimes to our feelings, as superior to Handel's as an original poem to a translation.

PURCHASE, Samuel, was born at Thaxted, in Essex, in 1577. He was educated at Cambridge, and was presented to a vicarage in his native county. This cure he resigned to his brother, and came to live in London, for the purpose of conducting the great work he had undertaken. The first volume folio appeared in 1613, under the title of "Purchas his Pilgrimage, or Relations of the World and the Religions observed in All Ages and Places discovered from the Creation unto this Present!" The other four volumes were published in 1625. To these the general title is "Hakluytus Posthumus, or Purchas his Pilgrims: containing a History of the World in Sea-voyages and Land-travels by Englishmen and others!" The name of Hakluyt is introduced, because Purchas became possessed of the papers which he left behind him. This great work, of which the object is to connect ancient and modern history, was well received, but probably involved the author in debt. He had been collated to the rectory of St. Martin's Ludgate, and was chaplain to Abbot, archbishop of Canterbury. He died about the year 1628, at the age of fifty-one. Biog. Brit.

PURCHASE, in Law, in its largest and most extensive sense, is defined by Littleton to be the possession of lands and tenements, which a man hath by his own act or agreement, and not by descent from any of his ancestors or kinred. In this sense, it is contradistinguished from acquisition by right of blood, and includes every other method of coming to an estate, but merely that by inheritance; in which the title is vested in a person, not by his own act or agreement, but by the single operation of law. (Co. Litt. 18.) Purchase, in its vulgar and confined acceptance, is applied only to the acquisition of goods, lands, tenements, or the like, by means of money, or some other valuable consideration.

What we call purchase, perquisitio, the feudists call conquest, conquenus, or conquerito (see Conquest); both denoting any means of acquiring an estate out of the common course of inheritance; and this is still the proper phrase in the law of Scotland. The difference, in effect, between the acquisition of an estate by descent and by purchase, consists principally in these two points.

1. That by purchase the estate acquires a new inheritable quality, and is descendible to the owner's blood in general, and not the blood only of some particular ancestor.

2. An estate taken by purchase will not make the heir answerable for the acts of the ancestor, as an estate by descent will. According to this legal significication of the word perquisitio, or purchase, it includes the five following methods of acquiring a title to estates, viz. escheat, occupancy, prerogation, forfeiture, and alienation, conveyance, or purchase, in its limited sense: under which latter head may be comprised any method in which estates are voluntarily resigned by one man, and accepted by another: whether that be effected by sale, gift, marriage-fettlement, devise, or other transmission of property, by the mutual consent of the parties. See the several articles, and Title.

Natural persons, incorporate persons, sole or aggregate, deaf, dumb, and blind persons, minors, and all reasonable creatures, may purchase, except in some cases; but some have capacity to purchase, and not to hold, as aliens, felons, &c.; and others have ability to hold or not to hold upon a purchase, at the election of themselves or others, as infants, and feme covertis. 1 Inft. 2, 3. 11 Rep. 77. 7 Rep. 17.

PURCHASE and value of land. See Valuation of Land, and Political Economy.

PURCHASE of rents. See Writt.

PURCHASE, in the Sea Language, has the same significication with draw in, at land. Thus, they say, the caplern purchaes space, i. e. draws in the cable space; and when they cannot draw or hale anything in with the tackle, they say, the tackle will not purchase.

PURCHASE is also a name given by sailors to any mechanical power employed in raising or removing heavy bodies, or in fixing or extending the ship's rigging. Such are the tackles, windlasses, caplerns, fcrews, and handspikes.

PURCHASE-Book, among Traders, is the name given to a book, which is a kind of journal, containing an account of all the purchases made, or things bought in the day.

PURCHASER, First, Perquisitor, in Law, denotes the person who first acquired an estate to his family, whether the same was transferred to him by sale or by gift, or by any other method, except only that of descent. See Descent.

PURCHASING of Estates, in Agriculture, the busineses of buying landed property. In order to perform this sort of bargain with propriety, and to the best advantage, attention is necessary to be had to a great variety of circumstances of different kinds, which respect the nature, quality, situation, condition, value, and conveniences of the property. See Valuation of Land.

But it is probably best done, when to any extent, by a surveyor or other person who is perfectly conversant with the nature of the busineses, and fully acquainted with the real
real value of landed property in the district where the purchase may be situated or met with.

It has been observed by Mr. Marshall, that there are two methods of making bargains of this kind, the one by public biddings, the other by private treaty or contract: in either of which, a certain degree of caution is common prudence. In the former, however, the conditions being fixed, an accurate valuation is the best safeguard; and, in the latter, among honest men little more is required.

In purchasing by private contract, the particulars which may be previously required to be furnished by the seller, are the quantities of the several pieces of the lands which are on fale, together with the maps, or rough drafts, of the same; the tenure under which they are held; some assurance as to the title of the seller; and his right of alienation; the tenancy under which the several farms are let; and, if on lives, the ages of the nominees; if for a term of years, the number which are unexpired; if at will, the notice with which the tenants have been served, if any have been given.

An abstract of the covenants under which they are let; particularly of those which relate to taxes and repairs, to the expenditure of produce, to the ploughing of grass-lands, &c. &c.

The existing rents and profits receivable; whether for tenanted lands, appurtenances, or abstract rights; with the estimated value of the demesne, and the woodlands in hand; together with the estimated value of the timber growing upon the estate on fale; as well as of the minerals and soils which it may contain.

The outgoings to which the estate is liable; the proposed time of the delivery of possession; the price and the mode of payment which are expected.

And next, it will be proper to let down the particulars of the instructions to be given to a surveyor, or other valuer, of the estate to be purchased. It will be right, however, to premise, that much, in this respect, depends on the probability of purchasing; and on the time which is allowed for making the estimate. In cases of fale by public auction, when there can be no certainty as to purchase, and where the time for valuation is limited, a rough estimate of each farm, and a general idea of the value of the timber and other appurtenances, may be all that can be prudently ascertained. But in a fale by private contract, where the refusal of an estate is granted, and time allowed for deliberation, a more minute investigation may be proper; especially where there is every reason to believe that a bargain will take place. For the fame report will not only serve as a guide to the purchaser, but will become a valuable foundation, on which to ground the future management of the estate. And for these and other reasons, a purchase by private contract is most to be desired by one who is not in the habit of personally attending public sales, and is unacquainted with the business of an auction room.

It may be noticed, that the particulars to be required from a surveyor, or surveyors, in these cases, are principally these: the rental value of each field or parcel of land, with the rate at which it lies, as to arable, meadow, pasture, or woodland; the value of the timber and other appurtenances: the characteristic, and the state of management of each farm or tenement, with the eligibility of the occupier; together with the state of repair of buildings, gates, fences, water-courses, and roads, the amount of the encumbrances and outgoings. And, lastly, the probable value of the improvements of which the estate may appear to be capable; whether by the several means that are commonly practised, or by new regulations and improved modes of agricultural management, that may admit of being introduced.

It is added, that these several particulars of information being procured, the subjects of treaty are few. The two statements having been duly compared, so that no misunderstanding can take place between the parties, the price, and the times and mode of payment, are the principal matters of agreement. A clear understanding respecting the custody of title deeds and the expences of conveyance, require, however, to be enumerated among the preliminaries of purchase.

In these transactions, it is also supposed, the business of negotiation is best carried on by letters, which become vouchers of facts. Whatever is done by interview, requires to be reduced to writing, and to be read by or to the parties before they separate, that no possibility of misconception may arise. And, added to these precautions, it is proper in large purchases, and when abstractions of intricate title deeds are to be made out, and examined, that a legal contract or memorandum of agreement should be entered into, for the mutual satisfaction and surety of the parties. This contract and the deed of conveyance, which is the instrument which is legally to transfer the property from the seller to the purchaser, may be said to conclude and ratify the business of purchase. And in this part of it, legal assent is essentially necessary; to examine existing deeds, and see that the seller has a legal right and clear title to the land, and a legal power to dispose of it; as well as to draw up or examine the fresh deed of conveyance, and see that it is sufficient to transfer the property legally and adequately to the purchaser.

PURCHASE, in Geography, a town of Spain, in the province of Andalusia; 60 miles N. of Grenada. N. lat. 37° 18'. W. long. 2° 30'.

PURE, something free from any admixture of foreign or heterogenous matters.

PURE Fire. See Fire.

PURE Hyperbola, in Conics, is an hyperbola without any oval, node, or conjugate point. See CURVE.

PURE Mathematics. See Mathematics.

PURE Proposition. See Proposition.

PURE Quadratics. See Quadratic.

PURE Refinements. See Resignation.

PURE Villages. See Villages.

PURE, or PURAN, in Geography, a town of Chili; 80 miles S.S.E. of La Conception.

PURBRAY, a town of Hindoostan, in Oude; 10 miles N. of Baharit.

PUREG, anciently Pura, once the capital of Gedroia (Mekran), and termination of the toilsome march of Alexander towards the frontiers of Caramania, is now a mean village.

PUREDRA, in Mythology, a name of Indra, the Hindoo regent of the firmament. (See INDRA.) The word is said to mean deputy of town, the Indian Jupiter having, in revenge for sacrificial flights or negligences, frequently, according to the Hindoo books, assumed that character. The ancient city of Ugeen, the capital of Malwa, was, according to tradition, destroyed by Indra. See UGEEN.

PURESIL, in Geography, a town of Hindoostan, in the ciear of Cicaco, 40 miles N.W. of Vizianagram.

PURETTA, a name given by some writers to the common shining black sand, used to throw over writing, and erroneously called by some steel-dust.

It is a natural mineral substance, found on the shores near Genoa, and in other places.
PURFLED, ornamental work, whether in stone or other materials, representing embroidery or lace work.

PURFLEW, a term in Heraldry, expressing eminences, peans, or any of the furs, when they compose a border found a coat of arms.

Thus they fay, heareth gules a border, purflew, vairly; meaning, that the border is vairly.

PURG, or FORG, in Geography, a town of Persia, in the province of Laristan; 60 miles N.E. of Lar. Lat. 28° 30'. E. long. 54° 40'.

Purgation, Purgatio, the act of purging, scouring, or purifying any thing, by separating and carrying off any impurities found therein.

Purgation, in Pharmacy, is the cleansing of a medicine by retrenching its superfluities; as taking the wood and seeds out of caffia, and the stones out of dates, tamarinds, and other fruits.

Purgation is also used, in Chemistry, for several preparations of metals and minerals, intended to clear them of their impurities; more usually called purification and refining.

The ordinary purgation of mercury is performed, by passing it through a chamois skin. (See Mercury.) Gold is purged by the coppel, cementation, &c. See Gold, Coppel, &c.

Purification, in other metals, is performed by repeated fusion, &c.

Purgation, Cathartia, in Medicine, the evacuation of the alimentary canal of its fecal contents, by means of substances which ferment its fibres, and excite them to a more active peristaltic motion. Purgation is also sometimes carried farther, and, by causing a copious discharge of fluids from the exhalent vesicles of the inner surface of the bowels, produces a considerable evacuation from the system at large. For an elucidation of the doctrine of purgation, see Cathartic.

Purification, in Law, is the clearing one self's of a crime, whereof publicly suspected or accused before a judge, called also judicium Dei.

Of these purgations there was anciently much use in England, especially touching matters of felony charged on clerks; and there is something of them still retained in the ecclesiastical court on suspicion of incontinency, &c.

Purification is either canonical or vulgar.

Purgation, Canonical, is that prescribed in the canon law, the form of which, obtaining in the spiritual court, is, that the party suspected shall take his oath that he is clear of the fault objected against him; and bring so many of his honest neighbours, not above twelve, as the court shall affign him, to swear, on their confidences, that they believe he swears truly.

The canonical doctrine of purgation, whereby the parties were obliged to answer upon oath to any matter, however criminal, that might be objected against them, continued till the middle of the 17th century to be upheld by the spiritual courts; when the legislator was obliged to interpose, to teach them a lesson of similar moderateness. By the statute of 15 Car. II. cap. 12. it is enacted, that it shall not be lawful for any bishop, or ecclesiastical judge, to tender or administer to any person whatsoever, the oath usually called the oath ex officio, or any other oath whereby he may be compelled to confess, accuse, or purge himself of any criminal matter or thing, whereby he may be liable to any censure or punishment. But this doth not extend to oaths in a civil suit; and, therefore, it is still the practice both in the spiritual courts, and in equity, to demand the personal answer of the party himself upon oath. Yet if in the bill any question be put, that tends to the discovery of any crime, the defendant may thereupon demur, and refuse to answer. Anciently, upon the allowance of the benefit of clergy, the person accused was delivered to the ordinary, to make his purgation, which was to be before a jury of twelve clerks, by his own oath affirming his innocence, and the oaths of twelve compurgators as to their belief of it. But now, by the Stat. 18 Eliz. cap. 7. this kind of purgation is also taken away; and the person admitted to his clergy shall not be delivered to the ordinary.

Purgation, Vulgar, being the most ancient manner, was by fire, or water, or combat: used by infidels, and by Christians too, till abolished by the canon law. See Ordeal, and Corned.

Combat, though now disused, may yet be still practiced by the laws of the realm, in cases where evidence is wanting, and where the defendant rather chooses combat than any other trial. See Combat.

Terris bonis, &c. redhabendis post Purgationem. See Terris.

Purgation, in Rhetoric, is used for that kind of defence which takes place when the accused person owns the fact, but denies that he did it with design, or with any bad intention.

Purgation, in Tragedy, is a term which Aristotle uses for the effect of tragedy on the mind.

That philosopher observes, that tragedy, by means of the terror and compulsion which it excites, purges passions out of the soul.

Indeed, Corneille adds, that tragedy frequently creates passions, instead of purging them; so that he takes Aristotle's purgation to be no more than a chimera.

Purifications, Menstrual, the cutamania or menes of women.

Purgative, or Purging-Medicine, a medicament, which evacuates the contents of the bowels by stool. See Cathartic.

Purgatory, Purgatorium, in the Romish church, a place where the just are supposed to suffer the pains due to their sins, for which they have not satisfied in this world.

It is by the mercy of God, the indulgences of the church, and the prayers of the faithful, that people are supposed to be delivered out of purgatory.

This doctrine of purgatory, which some derive from the Platonic fancies of Origen, the Montanists of Tertullian, pretended visionaries, and pagan stories, rhetorical flourishes, and doubtful expressions of the later fathers, and in which we may discern an obvious resemblance to the famous pagan doctrine, concerning the purification of departed souls by means of a certain kind of fire, was partly introduced, at least in the spirit of it, towards the close of the fifth century, and by Gregory the Great in the sixth century; but it was not, however, positively affirmed till about the year 1140, nor made an article of faith till the council of Trent. See Papists and Popery.

In Ireland is a place called "St. Patrick's purgatory," where, as the legend has it, at the prayers of St. Patrick, bishop of the place, there was made a visible representation of the pains which the wicked undergo after death, in order to deter sinners, &c.

Purgatity, in Geography, a town of Hindoosfan, in the circuit of Cicecole; 40 miles N.W. from Vizniagram.

Purge, in Medicine, a term frequently used for a dose of some purgative medicine.

Purging Ale, Butler's. See Ale.

Purging Grain, Oily, in Botany. See Sesamum.

Purging Nut, in Botany. See Jatropha.

Purging Thorn. See Buckthorn.

E. Purglitz.
PURGLITZ, or KRESSEN, in Geography, a citadel of Bohemia, in the circle of Rakonitz, where the royal treasures were anciently kept, and state prisoners confined; seven miles S.E. of Rakonitz.

PURGOT, a town of Hindooftan, in Coimbetore; 35 miles W. of Arcodelle.

PURGOW, a town of Hindooftan, in Bagiana; 25 miles E.N.E. of Balleen.

PURGSTALL, a town of Austria; four miles N. of Scheibis.

PURIFICATION, in Chemistry, &c. the act of purifying or refining natural bodies; or of separating the faces and impurities from them.

For the methods of purifying metals, gold, silver, iron, copper, tin, &c. see Gold, Silver, &c. and Refining.

For the purification of semi-metals, minerals, and other matters, as antimony, sulphur, camphor, saltpetre, &c. see Antimony, Sulphur, Camphor, &c.

Purification, in Pharmacy. See TRYING.

Purification, in Matters of Religion, denotes an offering made the priest by women riling out of child-bed, before they are re-admitted into the church.

By the law of Moses, a woman, after bringing forth a male child, was unclean forty days; after a female, eighty days; during which time, she was not to touch any thing holy, nor to go near the temple, but was to continue within doors, separate from all company, and commerce of others.

This term expired, she was to present herself at the temple, and at the door of the tabernacle, to offer a lamb, as an holocaust, and a pigeon or turtle; which the priest taking, offered to God, and prayed for her, that she might be purified.

This ceremony, which consisted of two things, an holocaust, and a sacrifice of expiation, was called פָּרָשׁוֹת הָרִם הַנִּנְיָא, purification, purgatio.

The holy Virgin, though, according to the fathers, exempt from the terms of the law, yet complied with it, and, at the time prescribed, went to the temple, and accomplished the law; in commemoration of which the church yearly solemnizes the feast of the Purification of the Virgin, on the second of February; called also the Feast of Candlemas.

Purification, The Feast of the, seems to be very ancient. It is ordinarily said to have been instituted in the time of Julian, in the year 342, and this on occasion of a mortality, which that year depopulated almost the whole city of Constantinople. Yet there are some, who imagine it to have been observed before, though in another manner, and on a different day from that fixed by Julian; viz. between the Circumcision and Epiphany. See CANDLES.

The same day is the presentation of our Saviour in the temple.

Purification, in Geography, a town of Mexico, in the province of Xalisco; eight miles S. of Compostella Nuova. N. lat. 19° 58'. W. long. 105° 46'.

PURIM, a solemn feast held among the Jews on the fourteenth and fifteenth of March, in memory of their deliverance from the conspiracy of Haman by Esther. See Esther.

This feast, which derives its name from the Persian word purim, q. d. lots, because it was by the casting of lots that Haman determined this time for the destruction of the Jews, is the Bacchanals of these people, which they celebrate with all manner of rejoicing, mirth, and jollity; indulging themselves with every kind of luxury, especially in drinking wine even to drunkenness, which they consider as part of the duty of the solemnity; because it was by means of the wine banquet (they say) that Esther made the king's heart merry, and brought him into that good humour, which inclined him to grant the request presented by her for their deliverance; and, therefore, they think they ought also to make their hearts merry, when they celebrate the commemoration of it. During this festival the book of Esther is solemnly read in all their synagogues from the beginning to the end, at which they are all to be present, men, women, children, and servants, because all shared in the benefit of the deliverance which Esther obtained for them. And as often as the name of Haman occurs in the reading of this book, the custom is for all to clap with their hands, and stamp with their feet, and cry out, Let his memory perish. Prideaux's Conn. vol. ii. p. 456.

PURITANS, in Ecclesiastical History. See Cathars and Novatians.

Puritans is also a term anciently used for the Calvinists of Great Britain, from their professing to follow the pure word of God, in opposition to all traditions, human constitutions, and other authorities.

The separation, whence this distinguishing appellation took its rise, commenced on the following occasion. Upon the accession of queen Mary, it was well known, that popery revived in this kingdom; the flatters of king Edward were repealed, and the penal laws against heretics were put in execution against the reformers. Many suffered at home; and others escaped the fury of persecution by seeking refuge in foreign countries. Some went to France and Flanders; some to Geneva; and others into those parts of Germany and Switzerland, where the reformation had taken place, and where the magistrates received them with great humanity, and allowed them places for public worship. The exiles were most numerous at Frankfort; and there that contest and division began, which gave rise to the Puritans, and to that separation from the church of England, which continues to this day. In the year 1554, some of the English fugitives settled in this city; and agreed to conduct their worship, without answering aloud after the minister, and without using the liturgy and surplice; to begin the public service with a general confession of sins, then to sing a psalm, after which the minister prayed for the divine affiaince, and next proceeded to the sermon; after sermon, a general prayer for all estates, and particularly for England, at the end of which was subjoined the Lord's prayer, and a rehearal of the articles of belief; then the people were to sing another psalm, and the minister to dismiss them with a blessing. Such was the order which they had unanimously adopted; and having chosen a minister and deacons, they invited their dispersed brethren to join with them. In the year 1556, Dr. Cox, afterwards bishop of Ely, came to settle at Frankfort with several of his friends; who interrupting the public service by answering aloud after the minister, and reading the whole litany, in violation of the agreement upon which the congregation was formed, overpowered the first settlers; and obtaining leave of the magistrates for the free use of king Edward's service-book, performed divine worship according to the rites that had been authorized by that prince; while others, who preferred the Genevan method of worship, as more pure and simple, left the city of Frankfort, and removed to Basil and Geneva. Thus commenced the distinction of Puritans and Conformists, by which the two parties were afterwards known. The former were called Conformists, on account of their compliance with the ecclesiastical laws enacted by Edw. VI. and the denominations of Nonconformists and Puritans were given to the latter, from their infilling upon a form of worship, more exempt from superflition, and of a purer kind than
than the liturgy of Edward seemed to them to be. Upon the accession of queen Elizabeth, the exiles returned to England, where each party strove to advance the reformation according to their own standard. The queen, with those who had weathered the storm at home, were only for restoring king Edward's liturgy; but the majority of the exiles were for the worship and discipline of the foreign churches, and refused to comply with the old establishment, declining loudly against the popish habits and ceremonies. However, the queen's party prevailed; and in 1559 a committee of divines was appointed to review king Edward's liturgy, who were instructed to strike out all offensive passages against the pope, and to make people easy about the belief of the corporeal presence of Christ in the sacrament. But no alterations were made in favour of those who now began to be called Puritans, from their attempting a purer form of worship and discipline than had yet been established; and whole sentiments in many points were agreed to, to be maintained by John Wickliffe, the first reformer. For they agreed with him in opinion, that in the sacrament of orders there ought to be but two degrees, prebendaries and bishops; that all human traditions are superfluous and sinful; that we must prudently and teach only the laws of Christ; that mystical and significant ceremonies in religious worship are unlawful; and that to refrain men to a prescrib'd form of prayer is contrary to the liberty granted them by God. The old festivals, with their eyes and the popish habits, were continued as they were in the second year of king Edward VI. In 1558 the act of supremacy was passed, in which there is a remarkable clause, that gave rise to the court of high-commission, which proved afterwards so oppressive; and in 1559 was passed an act for the uniformity of common prayer, and service in the church, and administration of the sacraments. The Puritans remonstrated against these proceedings, and complained, that the gross superstitions of popery, which they had looked upon as abrogated and abolished, were now revived, and even imposed by authority. Some required nothing less than that the church of England should be exactly modelled after that of Geneva; others only denied liberty of conscience, with the privilege of celebrating divine worship in their own way; but neither party obtained the object of their wishes. The queen, intent upon the suppression of this troublesome sect (as she was used to call it), permitted her enemies to employ for that purpose all the resources of artifice, and all the severity of the laws. The court reformers pleaded, that every prince had authority to correct all abuses of doctrine and worship within his own territories; the Puritans, on the other hand, whilst they disowned all foreign authority and jurisdiction over the church, could not admit of that extensive power which the crown claimed by the supremacy; apprehending it unreasonable, that the religion of a whole nation should be at the disposal of a single lay person. However, they took the oath, with the queen's explication in her injunctions, as retaining her majesty only to the ancient and natural rights of sovereign princes over their subjects.

Farther, the court reformers allowed, that the church of Rome was a true church, though corrupt in some points of doctrine and government; that all her ministrations were valid, and that the pope was a true bishop of Rome, though not of the universal church. But the Puritans affirmed the pope to be antichrist, the church of Rome to be no true church, and all her ministrations to be superfluous and idolatrous; they renounced her communion, and durst not suspend the validity of their ordinations upon an uninterrupted line of succession from the apostles through her hands. Moreover, it was agreed by all, that the holy scriptures were a perfect rule of faith; but the bishops and court reformers did not allow them to be the standard of discipline or church government; affirming that our Saviour and his apostles left it to the discretion of the civil magistrate, in those places where Christianeously should obtain, to accommodate the government of the church to the policy of the state. But the Puritans apprehended the holy scriptures to be a standard of church discipline as well as of doctrine; at least that nothing should be imposed as necessary but what was expressly contained in, or derived from them by necessary consequence, and, besides, they maintained that the discretion of the people was not lodged with the civil magistrate, but with the spiritual officers of the church. Farther, the court reformers maintained, that the practice of the primitive church for the first four or five centuries was a proper standard of church government and discipline, and in some respects a better than that of the apostles, which (according to them) was only accommodated to the infant state of the church while it was under persecution, whereas theirs was suited to the grandeur of a national establishment. Whereas the Puritans were for adhering to the Bible in the main principles of church government, and for admitting no church officers or ordinations, but such as are herein mentioned; and they apprehended, that the apostles, in establishing the first Christian church on the arithmetical plan therein observed in the Jewish sanhedrin, designed it as an unchangeable model to be followed in all times and places.

The court reformers also maintained, that things indifferent in their own nature, which are neither forbidden nor commanded in the holy scriptures, such as rites, ceremonies, habits, &c. might be settled, determined, and made necessary by the command of the civil magistrate, and that in such cases it was the indispensible duty of all subjects to observe them. But the Puritans insisted, that those things which Christ had left indifferent, ought not to be made necessary by any human laws, and that such rites and ceremonies as had been abjured to idolatry, and had a manifest tendency to lead men back to popery and superstition, were no longer indifferent, but to be rejected as unlawful. Nevertheless, both parties agreed too well in affording the necessity of an uniformity of public worship, and of calling in the sword of the magistrate for the support and defence of their several principles; which they made an ill use of in their turns, as they could grasp the power into their hands. The standard of uniformity, according to the bishops, was the queen's supremacy, and the law of the land; according to the Puritans, the decrees of provincial and national synods, allowed and enforced by the civil magistrate; but neither party was for admitting that liberty of conscience, and freedom of profession, which is every man's right, as far as is consistent with the peace of the government under which he lives.

In the year 1564, upon a report that the habits, enjoined on the clergy, were generally neglected, and also of attention to other imposed forms, the queen directed the ecclesiastical commissioners to consult some proper methods to reduce them to an exact uniformity; upon which they agreed on certain advertisements (as they were called), partly for due order in preaching and administering the sacraments, and partly for the apparel of ecclesiastical persons. To these advertisements certain protestations were annexed, to be made, promised, and subscribed by such as should hereafter be admitted to any office or cure in the church. The queen, though she would give no authority to the advertisements, which had occasioned much remonstrance and complaint, sifting out a proclamation in 1567, peremptorily re-
quir” uniformity in the habits, upon pain of prohibition from preaching, and deprivation. Parker, the archbishop of Canterbury, was violent and unrelenting; and by various methods of severity, harassed, flenched, and deprived many of those who persisted in the use of the habits. The suppliant ministers, finding that renewed applications to the queen and her counselors were ineffectual, published, in 1566, a small treatise in vindication of their conduct; in which they allege, that neither the prophets of the Old Testament, nor the apostles of the New, were distinguished by their garments; that a distinction of garments in the Christian church did not generally obtain till long after the riting of antichrist; that the garments against which they objected, had been abused to idolatry, forcery, and all kinds of conjurations; that they were an offence to weak Christians, an encouragement to ignorant and obdurate papists, and the use of them an affectation of returning to their communion; that at best they were only human appointments, subject to the apostle’s reproof, Col. ii. 20—22; that allowing them to be indifferent (which they did not grant), yet they ought not to be repented, because it was an infringement of the liberty with which Christ had made them free; and finally they urged the usage of foreign divines, who all condemned the habits, though they were not willing to hazard the reformation in its infancy, on account of them.

If, at this time, the habits and a few ceremonies had been left indifferent, both ministers and people would have acquiesced; but it was the compelling of these things by law that made them separate from the established church. Accordingly, in 1566, they came to a resolution, alleging it to be their duty, in their present circumstances, to break off from the public churches, and to assemble, as they had opportunity, in private houses, or elsewhere, to worship God in a manner that might not offend against the light of their conscience; and it was debated among them, whether they should use as much of the common prayer and service of the church as was not offensive, or resolve at once, since they were cut off from the church of England, to set up the purest and best form of worship, most consonant to the holy scriptures, and to the practice of the foreign reformers. The latter of these measures was concluded upon; and accordingly they laid aside the English liturgy, and made use of the Geneva service-book. However, it is necessary to observe, that though all the Puritans of these times would have remained in the church, if they might have been indulged in their habits and a few ceremonies; yet, they were far from being satisfied with the hierarchy. They had other objections besides those for which they were deprived; of which we shall here only join a summary. They complained of the bishops affecting to be thought a superior order to presbyters, and claiming the sole right of ordination, and the use of the keys; and assuming, in connection with their office, temporal dignities, titles, and employments. As long, however, as the English bishops pretended to derive their dignity and authority from no other source than the laws of their country, and pleaded a right, merely human, to the rank they held in the church and state, the controversy was carried on without excessive animosity and zeal; but the flame broke out with redoubled fury in the year 1588, when Bancroft, afterwards archbishop of Canterbury, ventured to affirm that the order of bishops was superior to the body of presbyters, not in consequence of any human institution, but juris divina, or by the express appointment of God himself. Farther, the Puritans excepted against the titles and offices of archdeacons, deans, chapters, and other officials, belonging to cathedrals, as having no foundation in scripture, or primitive antiquity, and intruding upon the privileges of the prebys ters in the several dioceses. They complained of the exorbitant power and jurisdiction of the bishops and their counselors in their spiritual courts, as derived from the canon law of the pope, and not from the word of God, or the statute law of the land. They lamented the want of a godly discipline, and were uneasy at the promiscuous and general access of all persons to the Lord’s table. Though they did not dispute the lawfulness of the forms of prayer, provided a due liberty was allowed for prayers of their own composition before and after sermon, yet they disliked the frequent repetition of the Lord’s prayer in the liturgy, the interruption of the prayers by the frequent repetitions of the people, some passages in the office of marriage, as With my body I thee worship, and in that of burial, as In fear and certain hope of the resurrection to eternal life, pronounced over the word of men, if not excommunicated, &c. They also objected against the reading of the apocryphal books in the church, while some parts of canonical scripture were omitted; and though they did not dislike the homilies, they thought that no man should be ordained a minister in the church who was not capable of preaching and expounding the holy scriptures. They disapproved of several of the church festivals or holidays, as having no foundation in scripture, or primitive antiquity; and they disallowed of the cathedral mode of worship; nor did they approve of musical instruments in the church service. Finally, they scrupled conformity to certain rites and ceremonies, which were enjoined by the rubric, or the queen’s injunctions; as the sign of the cross in baptism, baptism by midwives, or other women, in caes of sickness, and the mode of churching women; the use of god-fathers and god-mothers, to the exclusion of parents from being fireties for the education of their own children; the custom of confirming children, as soon as they could repeat the Lord’s prayer and their catechism, by which they had a right to come to the sacrament, without any other qualification, and the imposition of hands, as a sign of the divine favour, which seemed to them to imply a sacramental efficacy in this ceremony; kneeling at the sacrament of the Lord’s supper, which they considered that Christ gave it to his disciples rather in a pollic of sealing than of adoration; that it had no foundation in antiquity; that it had been grossly abused by the papists to idolatry in their adoration of the host; and that, if the pollic were indifferent, it ought not to be imposed as a necessary term of communion; nor did they approve of administering either of the sacraments in private, even in cases of danger; bowing at the name of Jesus; giving the ring in marriage, which they considered as derived from the papists, who made marriage a sacrament, and the ring a sign of facred sign or symbol; the prohibition of marriage during certain times of the year, and the licensing it for money; and, lastly, the wearing of the surplice, and other vestments to be used in divine service.

In points of doctrine there was, at this time, no difference between the Puritans and Conformists; and if we add one article more to the preceding, we shall have the principal heads of controversy between the church of England and the Protestant Dissenters, at this day; viz, the natural right which every man has to judge for himself, and make profession of that religion he apprehends most agreeable to truth, as far as it does not affect the peace and safety of the government under which he lives; without being determined by the prejudices of education, the laws of the civil magistrate, or the decrees of councils, churches, or synods. See Protestant Dissenters.

Towards the latter end of queen Elizabeth’s reign, there arose a party, which were first for softening, and then for overthrowing,
overthrowing, the received opinions concerning predestination, perseverance, free-will, effectual grace, and the extent of Christ's redemption. The clergy of the episcopal church began to lean towards the notions concerning these intricate points, which Arminianism propagated some time after this; while on the other hand, the Puritans adhered rigorously to the system of Calvin. Several episcopal doctors remained attached to the same system in the reign of James I. &c. and all these abettors of Calvinism, whether episcopal or presbyterian, were called doctrinal Puritans. At length, according to Mr. Fuller, (Church Hist. book ix. p. 97. book x. p. 1000.) the name was extended to rigmatize all those who endeavoured in their devotions to accompany the minister with a pure heart, and who were remarkably holy in their conversation; so that a Puritan was a man of severe morals, a Calvinist in doctrine, and a Non-conformist to the ceremonies and discipline of the church, though he did not totally separate from it.

Queen Elizabeth was violent in her opposition to the Puritans through the whole course of her reign; and besides the ordinary courts of the bishops, erected, as we have already observed, a new tribunal, called the court of high-commission, which suspended and deprived men of their livings, not by the verdict of twelve men upon oath, but by the solemn determination of three commissioners of her own nomination, founded not upon the statute law of the realm, but upon the canon law; and instead of producing witnesses in open court to prove the charge, they assumed a power of administrating an oath ex officio, by which the prisoner was obliged to answer all questions the court should put to him, though never so prejudicial to his own defence. If he refused to swear, he was imprisoned for contempt; and if he took the oath, he was convicted upon his own confession.

During the reign of James I. from whom the Puritans expected more indulgent treatment, they were treated with great severity, and many of them were obliged to leave the kingdom, and retire to Holland; and from thence considerable numbers migrated to America in the year 1620. All were Puritans, in the estimation of King James, who adhered to the laws of the land in opposition to his arbitrary government, though otherwise ever so good churchmen. These were called Puritans in the large; and those who scrupled the ceremonies, and adhered to the doctrines of Calvin, were Church Puritans, who, though comparatively few, yet being joined by those of the other classes, became the majority of the nation. The success which attended the first emigrants, who settled in that part of America afterwards called New Plymouth, engaged great numbers of Puritans, who groaned under the oppression of the bishops, and the severity of a court, by which this oppression was authorized, to follow the fortunes of these religious adventurers; and this produced a second emigration in the year 1629, which gave birth to the second grand colony, commonly known by the name of the Massachusetts's Bay. The colony of Connecticut was formed by emigrants of the same classes in 1636, and that of New Haven in 1637, who fled from the persecution of Laud, and the oppressions of the star-chamber and high-commission courts. Afterwards, when the Puritans were not allowed to transport themselves to New England, many of them removed, with their families, into the Low Countries.

After the reformation of Charles II. in the year 1662, the name of Puritans, says bishop Burnet, was changed into that of Protestant Non-conformists, who were subdivided into Presbyterians, Independents, Anabaptists, and Quakers. At this time a public law, called the Act of Uniformity, was enacted, by which all who refused to observe the rites, and subscribe the doctrines of the church of England, were entirely excluded from its communion. From this period until the reign of king William III. the Non-conformists were in a precarious and changeable situation, sometimes involved in calamity and trouble, and at other times enjoying some intervals of tranquillity and certain gleams of hope, according to the varying spirit of the court and ministry, but never entirely free from perplexities and fears. But in the year 1689, their affairs took a favourable turn, when a bill for the toleration of all Protestant Dissenters from the church of England, except the Socinians, passed in parliament, almost without opposition, and delivered those who could comply with the conditions it imposed, from the penal laws to which they had been subjected by the act of uniformity, and other acts passed under the house of Stuart. For the present state of the toleration, see Toleration. See also Corporations Act and Test. Neal's Hist. of the Puritans, in 4 vols. 8vo. paufim.

PURITY, in Oratory, is one of the constituent parts of elegance, and denotes the choice of such words and phrases as are fitted and agreeable to the use of the language in which we speak. Grammarians reduce the faults which they oppose to it to two sorts, which they call barbarism and obscurity; the former of which respects single words, and is an offence against etymology, and the reproach of it is incurred by the use of words entirely obsolete, or by new formations and compositions, from simple and primitive words in present use. The latter respects the construction of words, and is an offence against syntax; to which Dr. Campbell adds a third class of faults, under the denomination of impropriety, which is an offence against lexicography, the business of which is to assign to every word of the language the precise meaning or meanings which use hath alligned to it. This impropriety occurs both in single words and in phrases. Dr. Ward recounts the principal things that vitiate the purity of language. It often happens, he says, that such words and forms of speaking, as were introduced by the learned, are afterwards dropped by them, as mean and forlorn, from a seeming barbarism contracted by vulgar use: and it is common to language, with all other human productions, that it is in its own nature liable to a constant change. (Hor. Art. Post. v. 68.) We must, therefore, no less abdote from antiquated, or obsolete words and phrases, than from forlorn ones. On the other hand, we should refrain from new ones, or such, whose use has not yet sufficiently established, at least among those of the best taste. Besides, any mistake in the sense of words or their construction, is opposed to purity: for to speak purely is to speak correctly. And farther, a distinction ought to be made between a poetic diction, and that of prose writers: for poets in all languages have a sort of peculiar dialect, and take greater liberties, not only in their figures, but also in their choice and disposition of words: so that what is a beauty in them, would often appear unnatural and affected in prose. Ward's Or. vol. i. p. 382, &c. Campbell's Phil. of Rhet. vol. i. p. 409, &c.
that the manner in which these woodlands are occupied is
exactly the same as that of many of the royal forests, with
the exception of the right of pillage, and for that reason
much more productive and beneficial. See Woods and
Royal Forests.

PURITY, in Building, those pieces of timber that
lie above the rafters on the inside, to keep them from fink-
ing in the middle of their length.

PURLUE, Purlieu, or Pouralle, formed from the
French pur, pure, and lieu, place, is all that ground near any
forest, which, being added to the ancient forest by our kings,
was, by perambulation, granted by some of their successors,
fevered again from the same, and made purlieu, i.e. pure
and free from the laws and obedience of the forest.

A purlieu, or pouralle, is defined a circuit of ground ad-
joining to the forest, and circumfered with immovable
boundaries, known only by matter of record; which com-
pas of ground was once forest, and afterwards was dis-
afforested by the perambulations made for severing the new
forest from the old.

Purlieus, or pourallees, commenced after the manner fol-
loving. King Henry I. at his accession to the crown in
1154, took so much delight in the forests of this kingdom,
that, not being contented with those he found there, though
many and large, he began to enlarge divers of them, and to
disafforest the lands of his subjects nearly adjoining to the same.

His successors, Henry II. and Richard I., far from in-
trenching or reddening any thing, made still further encroach-
ments: and thus did the lands continue till the 17th year of
John; at which time, the grievance being grown
unglorious, and generally felt by all degrees of people, divers
noblemen and gentlemen besought the king to grant, that
they might have all those new afforestellations made by his
predecessors aforesaid, and by himself, disafforested again;
and the king, after much solicitation, was at length pre-
vailed on to subscribe and seal such articles concerning the
liberties of the forest, as they then demanded; being, for
the most part, such as are now contained in the Charter of
the Forest.

Hereupon choice was made of divers noblemen, &c. to
the number of twenty-five, who were sworn, with others
their affiltes, to see the said liberties, so granted, and con-
firmed by the king, to be in every point observed.

But, before any thing was done to the purpose, king
John died; and king Henry III. succeeding, fresh solici-
tations were made to him who, for the better accom-
plishing of the said disafforestemt, ordered inquisitions to be
taken, by substantial juries, for severing all the new
forests from the old; upon which, two commissioners were
sent to take those inquisitions; in virtue whereof, many
great woods and lands were not disafforested, but were
improved to arable lands by the owners thereof. After
this charter was made and confirmed, some of those new
afforestellations were perambulated, and proper inquisitions
taken, and the certainty was determined by matter of re-
cord, which, taken, the old, and which the new: though it
appears, that the greatest part of the new disafforestellations
were still remaining during the life of king Henry III.

Under Edward I. fresh petitions and solicitations being
bet on foot, three bishops, three earls, and three barons,
were at length appointed to see those perambulations per-
formed and continued; who caused them to be made ac-
cordingly, and inquisitions to be taken thereupon, and re-
turned into the court of chancery; and all those that were
ancient forest to be meared, and bounded with irremovable
boundaries, to be known by matter of record for ever.

Those woods and lands, that had been newly disafforested,
the king likewise caused to be separated from the old, and
to be returned into the chancery by marks, meres, and
bounds, to be known in like manner by matter of record for
ever.

Thus it appears how the purlieus, or pourallees, had
their first beginning; for all such woods and lands as were
disafforested by Henry II. Richard I. or king John, and, by
perambulations, severed from the ancient forests, were, and
yet are, called pourallees. of d. woods and lands severed from
the old forests, and disafforested by perambulation; pouralle
being the same as perambulatio, in Latin.

But, notwithstanding such new disafforestellations were dis-
afforested by perambulation, whereby the same became
pourallees, or purlieus; yet they were not thereby so disaffo-
rested as to every man, but that they do, in some sense, continue forest till as to other. For, by the words of
Charta de Foresta, if the king has disafforested any woods or
lands of his subjects, to the damage of the proprietors,
they should forthwith be disafforested again; that is, only
as to those persons whose woods and lands they were; who,
as the proper owners thereof, might fell and cut down their
woods at their own pleasure, without any licence from the
king; as also convert their meadows and pâtures into til-
lage, or otherwise improve their ground to the best advan-
tage. So also the landed gentry, and chase the wild beasts
of the forest towards the same, &c. But no other person
should claim such benefit of hunting in the pourallees,
beides the proper owner of the soil thereof, who is left at
liberty to suffer the pourallees to remain forest till, as fome,
in effect, have thought most expedient, because thereby en-
titled to the benefit of the common within the forest, which
otherwise they were excluded from. Hence, if the bears
chance to wander out of the forest into the pourallees, the
king hath a property in them, whilst every man, but
the owner of the ground wherein they are, who hath a spe-
cial property in them, ratione foli; yet so as he may only
take them by hunting, or chasing with his greyhounds or
dogs, without any foresetlling or foresetting them in their
course again towards the forest.

Before what hitherto has been said of the difference be-
tween forest and purlieu, or pourallees, there is this farther
diversity, that all the woods and lands within the regard
of the forest are absolutely within the bondage or charge of
the forest, as well in respect to the owners thereof, as of
any other person; for no one may cut down his own woods,
or improve his own lands, within the regard of the forest,
without licence from the king or his chief justice in eyre of
the forest. Neither shall any person hunt, chase, or molest
the wild beasts of the forest in his ground, within the regard
of the forest, without licence or warrant from the king, or
his chief justice of the forest to so do.

But those, whole grounds are within the purlieus, are
not subject to these restrictions. Yet are not the woods
and lands in the purlieus absolutely freed from the bondage
of the forest, in respect of the wild beasts having their
haunts therein, when they happen to stray out of the forest;
but as they were once absolutely forest, so they are still con-
ditionally so.

PURLIEU-Man, or Purlieu-man, or Pouralle-man, is one
who has land within the purlieu; and is allowed or qualified
to hunt or course within the same, though under certain
restrictions.

By Stat. 13 Ric. II. he who may lawfully hunt in any
pourallees, ought to have woods or lands of freehold within
the purlieu, to the yearly value of 40L. By Stat. Jac. 1,
he ought to have lands of inheritance of the yearly value
of 10l. or lands of freehold of the yearly value of 30l. or
have
have goods worth 200l. or be the son of a knight or baron, or
perfon of a higher degree, or fon and heir apparent of an
esquire. But, by a later act, Car. II. no man may keep
greyhounds within the pouralle, or elsewhere, within
England or Wales, unless he have a free warren, or be
lord of a manor, or such a freewarre, as is afeid, in his
own right, or in right of his wife, or within lands, tenements, or
heritaments of the clear yearly value of 40l. over and
above all charges and reprifes of such effate of inheritance;
or of lands, tenements, or hereditaments, in his own right,
or in right of his wife, for term of life or lives, of the yearly
value of 80l. over and above all charges and reprifes, or that
is worth in goods in chattels 400l.

The pouralle, or purhane, then, is fayd to be for him that
is fo qualified: others, not qualified, and therefore not pur-
hane-men, yet having land in the pouralle, may, if they
find any wild beafts of the forest in their own ground
within the pouralle, chafe them thereout with little dogs;
but not with greyhounds, or other dogs.
Nor is the purhane-men left at large to hunt at his own
determination; but he is tied down to several rules: as,
1. That he always begins his chase in his own ground;
and, that, though he finds such wild beafts in his own
pouralle, and in respect thereof, hath a property in them,
ratione fatis, against all perfon, but the king; yet such
his property is only on this condition, that he can flay them
with his dogs in chase, without foareftalling them, before
they can recover the fell. If they be within the liit
of the forest, before the dogs flain them, they are the
king's, or other owner of the fell.
2. But if the pourhane-man firft make his chase in his
own freehold, he may pursue the fame through every man's
ground within the pouralle, and his dogs falen on a wild
beast, before he can get within the bounds of the forest,
and the beast draws the dogs into the forest, and is there slain by
them; here the pourhane-man fhall not enter into the forest,
nor take the beast so killed, because his course was irregular
from the beginning, as he could claim no property in the
beast, ratione fatis.
3. A pourhane-man may hunt in his own pouralle with
no more company than his own servants; neither may he
appoint, licence, or warrant any other perfon, except his
servants, to hunt by his commandment in his pouralle.
4. Every pourhane-man is forbidden, by the laws of the
forest, to hunt in his own grounds within the pouralle every
day, or oftener than three days in any one week, Sunday
excepted.
5. Nor is any man to disturb, or make a course after any
deer found in his pouralle, within forty days after the king
hath made a general hunting in the forest adjoining there-
unto; because then the wild beafts of the forest come not
into the pouralle of their own accord, but as they are
forced into the same by the hunters, with clamours, and
blowing of horns, fo that they fly thither for refuge.
6. No man shall hunt within seven miles of the borders of
the forest, or in his own pouralle, within forty days next
before the king hath issued out his proclamation, declaring
his royal will and pleasure to make a general hunting in that
forest.

Inasmuch as the pouralle were once, and in some fenfe
still are forest, it was necessary to have officers to attend,
and take on them the charge of the preservation of the
game that may happen to wander out of the forest into the
pouralle; since otherwise the laws of the pouralle could
not be executed, but the forest itself would soon be destroyed
by the pouralle-men.

For this reason, rangers were first appointed, who,
though not officers in the forest, yet appertain thereto; for
all officers in the forest have charge of the vert and venison
of the forest; but a ranger hath no charge of the vert, but
only of venison coming out of the forest, into the pouralle,
his place of charge; from whence his office is to conduct
the same back again into the forest.

This officer is appointed by the king, or his chief justice
in eyre, and is made by patent, with a fee commonly of
twenty, thirty, or forty pounds, or more, by the year,
payable out of the exchequer, as also certain fees, deer, and
fallow, to be taken annually, at proper feasons, out
of the forest.
The substance of his oath is, to rechase, and with his
hounds drive back, the wild beafts of the forest, as often as
they range out of the same into his pouralle; to prevent all
unlawful hunting and hounding of wild beafts of venery and
chase, as well within the pouralle, as within the forest;
and to prevent thefe and other offences, at the next court
of attachments or swainmote, which shall first happen.

Rangers, it is to be observed, belong only to such pou-
ralles as were once the woods and lands of the subject, and
were afterwards diffafised again, and so became pour-
alle. Hence, as there are some forests in England, which
never had any enlargement by new affeerations, and there-
fore have no pouralle at this day, there can be no rangers
belonging to them. Manwood's Forest Laws, part 2. c. 70.
4 Inf. 503. 4. 1 Jones's Rep. 278. Moor. 706. 987.

PURNALL, in Geography, a town of Hindooftan; 15
miles W.S.W. of Allahabad.

PURNERENT, a town of North Holland, on a brook
of the fame name, governed by a council, bailiff, and burgo-
masters. The town had a voice in the assembly of the flates;
10 miles N. of Amsterdam. N. lat. 52° 33'. E. long. 4°
46'.—Also, a small island near the coast of Java, on which
lies an hospital for the diseased poor of Batavia.—Also, a
small island in a large bay on the N. coast of New Guinea.
S. lat. 2° 16'. E. long. 135° 12'.

PURNA. See PANNAH.

PURNACH, a circur of Bengal, bounded on the N.
by Murung, on the E. by Dinagepour, on the S. by Raj-
mal, and on the W. by Bahar; about 80 miles long from
N.E. to S.W., and 70 from N.W. to S.E. The capital of
the fame name is fituated on a river which runs into the
Ganges; 200 miles N. of Calcutta. N. lat. 25° 48'. E.
long. 87° 46'.

PURNITZ, a town of Moravis, in the circle of Iglau;
7 miles S.E. of Iglau.

PURPARTY (Fr. pour part, i.e. pro parte) is that
part or share of an estate, first held in common by parcers,
which is by partition allotted to any of them. To make
purparty is to divide and fever the lands that fall to par-
cers, which till partition they held jointly, and pro indivi-
duo. Old Nat. Br. 11.

PURPLE, PURPURA, a red colour, bordering on
violet; now dyed chiefly with cochenille.

Purple was much esteemed among the ancients; espe-
cially the Tyrian purple, which underwent more dyes than
the red, and which was almost peculiar to the emperors and
kings. Yet this purple did not exceed that now in use.
The chief reasons why the ancient purple dye has been dif-
figured are, that the latter is both cheaper and finer.

The ancient purple was tinged or given with the blood
or juice of a precious turbinated tellinaceous sea-fish, called
by the Greeks περπυρα, and by the Latins purpura; of
which we have descriptions in several authors, and shells in
most of the cabinets of the curious. See PURPLE-FISH.
The method of obtaining the colour, Mr. Cole (see Purpl. Fitch) describes thus:

The shell, which is very hard, being broken, (with the mouth of the fish downwards, so as not to crush the body,) and the broken pieces being picked off, there appears a white vein lying transversely in a little furrow or cleft next the head of the fish.

In this vein is the purple matter lodged; some of which, being laid on linen, appears at first of a light green colour; and, if exposed to the sun, changes into a deep green, and in a few minutes, into a sea-green, and, in a few more, into a blue; whence it soon becomes of a purple-red, and, in an hour more, of a deep purple red.

And here the sun’s action terminates; but by washing in scalding water and soap, and drying it, the colour ripens to a mottled bright and beautiful crimson, which will bear washing admirably without the addition of any dyptic. While the cloth marked with this colour lies in the sun, it will yield a very strong and fresh smell, as if garlic and asa förada were mixed together.

The juice which gives this beautiful purple colour is, says M. du Hamel, while it remains in the body of the animal, and while that is in health, wholly white; but no sooner is it exposed to the sun, than it begins to change colour, and in less than five minutes goes through the several changes of pale green, yellowish, and a beautiful emerald green; after this it becomes of a deeper and duller green, then blueish, reddish, and finally a deep and very beautiful purple. Sometimes the juice is found naturally green in the animal: this is probably from the creature’s being in a diseased state. But when it is naturally thus, it immediately becomes red, and afterwards purple, on being exposed to the sun; its several preceding changes seeming to have been made already in the body of the animal.

If a piece of linen is rubbed over with this juice, and part of it exposed to the sun, part not, that only will turn red which is so exposed, the other remaining green without any alteration; and it is observed, that the stronger the sun’s influence, the quicker the change appears, and probably the colour is in proportion also the more beautiful and lively. And it is very remarkable, that if a needle, or any other opaque body, be laid upon the linen which is yet green, and is to become red on being exposed to the sun; after such an exposure, the whole shall be changed red or purple, excepting only that small spot which is covered by the needle, which will still remain green.

A plate of glass, though it be three inches thick, will not prevent the colour from changing purple by being laid over it; but the thinnest piece of metal will keep it wholly green. The one being opaque, and the other pellucid, are evidently the only reasons for this difference.

If the coloured linen be successively covered by three pieces of paper, the one blacked with ink, the other in its natural state, and the third rubbed over with oil, it will change colour on being exposed to the sun in different degrees; and that exactly in proportion to the degree of transparency in each of the papers; most of all in that which was covered with the oiled paper; something less in that covered by the paper in its natural state; and least of all in that which was covered with the blacked paper, as that is least transparent.

The common heat of a fire, or that of a red-hot iron, produces no change at all in the colour when green. The vapour of burning sulphur produces a little; but the green, which had not changed to purple by these experiments, immediately changed to it on being exposed to the rays of the sun.

These experiments were all made in the months of January and February, by M. du Hamel, in Provence; and the sun having power to change the colour so speedily there in these cold months, probably in a warmer climate or season the air would have been sufficient for the purpose, without the open sun; since it seems, from experiment, that both the solar rays, and the light alone in a cloudy day, can act upon this colour. The light and heat of the sun both act on this colour: light is always sufficient to produce the effect, but the heat may easily be too great or too little; and to do the whole in perfection, it must be at a certain middle degree.

This beautiful purple, if it can ever be brought into use in dyeing, will have one very great advantage from its viscosity. The pieces of cloth that had been flayed by it retained their colour, in spite of several boilings in different liquors, which M. du Hamel made them pass through; and the colour, on examination, was found not to be superficial, but penetrated the whole body of the stuff, which was tinged by it. There are many inconveniences which must naturally attend the use of this substance as a dye, but they may, perhaps, all be got over by care and application. It is very certain, that it is of too vicid a nature easily to penetrate many substances; but it is also certain, that this might be obviated by dissolving it in some proper liquor. It appears very plainly, that the ancients had a method of thus dissolving their purple; but we neither know what was their purple, nor what was its dissolvent; nor, which would be of much more importance to us at present, what is the proper dissolvent for our own. Mem. Acad. Scienc. Par. 1756.

M. Reaumur has also discovered another very different kind of purple. This is produced in oval grains about a quarter of an inch long, full of white liquor bordering on yellow, which cover certain stones or sands, about which the buccina of Poitou usually assemble.

By the experiments M. Reaumur has made, it appears that these grains are neither the eggs of the buccinum, nor the seeds of any sea-plants, nor any rising plants, but the eggs of some other unknown fish.

These grains, being bruised on a white linen, at first only tinge it yellow, and that insensibly; but in three or four minutes they give it a very beautiful purple red, provided the linen be exposed to the open air; for the air of a room, even though the windows be open, will not do. This colour fades, however, a little by repeated washings.

M. Reaumur concludes, from some experiments he made, that the effect of the air on the liquor does not consist in its taking away any particles of it, nor in giving it any new ones, but only in its agitating it, and changing the arrangement of the parts that compose it. He adds, that the liquor of the buccinum, and that of the grains, seem to be nearly of the same nature: except that the latter is more watery, and only saline; whereas the other is hot, and pungent.

P. Labat gives us the description of another purple dye, produced by a tree growing in the Antilles. The juice of this tree, when cut running, is of a blood-red, and communicates the same colour to clothes; though, like the former, it lasts much in often washing.

Purple, Dyeing. See Dyeing.

Purple Gold. See Gold Precipitate, &c.

Purple, in Medicine, an epithet applied to every disease, in which eruptions of purple spots, or petechias, appear, and these being usually the accompaniments of fevers of every kind in their worst and most dangerous forms, to purple fever.
fever was nearly synonymous with putrid, or malignant fever. See Petechiae, and Purpura.

Purple Apple, in Botany. See Annona.

Purple Fish, Purpura, in Natural History, the name of a genus of shell-fish, the characters of which are these: it is an univalve shell, jagged and befit from head to tail with spines, tubercles, umbos, or spicules. The mouth is small and roundish; the tail is short, and usually the base runs out into a long beak. See Dyeing.

It has been usual with most authors to confound together the genera of the murex and purpura, and to use the words as synonymous: but though there is some external resemblance between many of the shells of the two genera, yet they are easily distinguished by this, that the mouth of the purpura is less long, and is less dentated and slanled than that of the murex. The body and the head of the shells of this genus are not so elevated as those of the murex kind, and are not covered with points or buttons at the mouth. If a shell is therefore found to have a small, smooth, and round mouth, and a body covered with undulated leaves, as it were, like those of favor or endive, and sometimes with long points, and its tail, whether long or short, be hollowed and somewhat bent, this may be called a purpura, and not a murex. Linnaeus makes the purpura a species of the murex.

The ancients distinguished three kinds of purpura; one which had a long and crooked tail, made hollow like a tube or pipe; a second which had either no tail at all, or at the most a very short one; and a third which had no spiral head, or, as we should express it, no clavicle.

On examining the whole family of the purpuræ, we may distinguish four remarkable specific differences among them. The first of these comprehends those purpræ which have the body of the shell garnished with a fort of undulated foliation in clouded ridges, and have a short and crooked tail. The second comprehends those which have the body of the shell covered with acute points, and have a long tail. The third comprehends those which have as long a tail as the former, but have a smooth body, or at the utmost have only a few flat protuberances and wrinkles on it. And the fourth takes in those which are small, and have an elevated clavicle, a short crooked tail, and the body of which is covered either with slender spines or hairs.

This species of fish, as well as the murex, served among the ancients to dye the fine purple colour they were so fond of, and some of the buccina (e.g. the lapillus of Linnaeus) have been of late found to have the same juice. The purpura and murex are both fished up in great plenty in the gulf of Tarentum; but the small quantity of the coloured juice which each fish contains, and the necessity of using it before the animal dies, makes it impossible to bring it to any regular article of traffic. The ancients used this colour only on cotton and woolen stuffs; whereas our cochineal, which was unknown to the ancients, strikes equally well on silks and stuffs. These shells are also found in various parts of the Mediterranean.

In the seas of the Spanish West Indies about Nicoya, is found a shell-fish, which perfectly resembles the ancient purpura, and, in all probability, is the same fish. This fish, Cage tells us, usually lives seven years; it hides itself a little before the dog days, and continues to disappear for three hundred days running.

They are gathered plentifully in the spring, and, by rubbing one against another, they yield a kind of salvia or thick hair, resembling soft wax; but the purple dye is in the throat of the fish, and the fleshy part is lodged in a little white vein; the rest of the body is of no use. He adds, that the chief

riches of Nicoya consist in this fish. Cloth of Segovia, dyed with it, is sold for twenty crowns the ell; and none but the greatest Spanish lords use it.

There are also found upon the coasts of the South-sea, near the equator, in the neighbourhood of the St. Helena, in the province of Guayaquil, certain sea-fish, as Don Antonio de Ulloa calls them, picking at the bones, and covered by the sea at high water, about the size of small nuts, which contain a liquor or juice that has the true colour of purple. The colour is very bright, and so durable, that washing rather increases than diminishes its luster, nor does it fade or decay by use and wearing. Woven stuffs are not dyed with it, but only cotton threads. As soon as a sufficient quantity of the liquor is squeezed from the fish, the cotton thread is drawn through it, and it takes and retains the tincture without any farther trouble; but the purple colour is not discovered till the thread is dry, the juice being of a milky colour at first, but it soon changes into green, and at last settles in a purple.

Besides the Indian purple fihes, we have others much nearer home. In the Philosoph. Transact. abr. vol. ii. p. 823, we have an account of purple fish discovered in 1684, by Mr. W. Cole, on the coasts of Somersetshire, South Wales, &c. where it is found in great abundance. The modern purple fish, M. Reaumur observes, is a kind of buccina, a name given by the ancients to all fishes whose shell bears any resemblance to a hunting-horn; and it appears from Pliny, that part of the ancient purple was taken from this kind of shell-fish: so that this may be esteemed a recovery of what had been suppos'd entirely lost. See Dyeing.

The fish, he observes, is good; and adds, that there are several kinds of it differing in size and shell, and also in the colour of the tingling liquor. There are some found on the coasts of Poictou.

The Caribbee islands have likewise their purple fish. This is called tozan, being of the size of the end of the finger, and resembling our periwinkles; its shell is of a brownish azure, its flesh white, its intestines of a very bright red, the colour of which appears through the body; and it is this that dyes the froth, which it calls forth when taken, and which is at first of a violet hue, bordering on blue.

To oblige them to yield the greater quantity of froth, they lay them on a plate, and shake and beat them against one another, upon which the plate is immediately covered with the froth, which is received on a linen cloth, and becomes purple in proportion as it dries.

P. Labat observes, that if this be the real Tyrian purple, the secret of preparing and fixing it is lost; this colour being found to dwindle and dissipate, in proportion as the linen dyed with it is washed.

The purpura lives on other fish. It usually hides itself at a small depth in the sand, sometimes even in fresh-water rivers, and as it lies hid, it thrills up a pointed tongue, which wounds and kills any thing that comes over it. We frequently find sea-shells with round holes bored through them, as regularly as if made with a boring instrument: these are generally allowed to be made by the tongue of the purpura, in order to its feeding on the fish within.

The purpura has two horns like that of a snail; and Fabius Columna says, that they have eyes in these, not placed at the ends, as in the snail, but in the middle of each horn.

The purpura is a shell-fish very well known, and has been known also in almost all times to afford a purple liquor; but as there has been no method discovered of bringing this li-
the gentlest pressure on the skin, such as is applied in feeling the pulse, will produce a purple blotch, like that which follows a fever blow.

When the disease is full more severe, in addition to these effusions of blood under the cuticle, considerable discharges of blood take place from those parts which are defended by a very delicate cuticle; whence these hemorrhages originate particularly from the internal passages and organs, and are occasionally very profuse, and occasionally destroying life. Most frequently, however, the bleeding is slow, and in small quantity, sometimes almost a constant oozying, and sometimes returning at intervals. These hemorrhages take place from the gums, nostrils, throat, the inside of the cheeks, the tongue, and lips; sometimes from the lining membrane of the eye-lids, the urethra, and the external ear; and often from the internal cavities, the lungs, stomach, bowels, kidney, uterus, and bladder. There is great variety, however, in the periods of the disease at which the hemorrhages commence and cease, and as to the proportion which they bear to the cutaneous effusion.

This singular disease occasionally appears suddenly, in the midst of good health, attacking during the night. It is always accompanied by great debility and depression of spirits; and often by pains in the chest, loins, or abdomen, by irregularity of bowels, or by cough; and the pulse is sometimes slightly quickened and very feeble, as in a moderate hectic. But in some cases these functions are not perceptibly disturbed. The duration of the disease is usually uncertain: in some instances it has terminated in a few days, while in others it has continued not only many months, but years. When it terminates fatally, it is commonly in consequence of a copious hemorrhage, either suddenly from some important organ, or more slowly from several parts at the same time.

The causes of this disease are not clearly ascertained, nor its pathology well understood. It occurs at every period of life, and in both sexes; but most frequently in women, and in boys before the age of puberty, particularly in those who are of a delicate habit, who live in cloze and crowded situations, and on poor diet, or are employed in sedentary occupations, and subject to grief, anxiety, fatigue, and want of sleep. It has likewise attacked those who are left in a state of debility by previous acute and chronic diseases, as after small-pox or small-pox-like diseases, or in a puerperal state, or after a violent suppuration from mercury. On the other hand, however, the disease appears occasionally in its most severe and fatal form, where none of those circumstances had previously existed: for instance, in young persons living in the country, and suffering no privation of any of the comforts of life, and previously enjoying good health. This fact tends greatly to obscure the pathology of the disease: for it renders the operation of these alleged causes extremely questionable, and it seems to establish an essential difference between purpura and scurvy, in the origin and nature of the morbid actions which constitute the disease. In scurvy (by which we mean the scorbutus, or true scurvy, formerly prevalent among seamen in long voyages, and among people in besieged towns, and other situations, when living upon putrid, salted, dried, or otherwise indigestible food, yielding imperfect nutriment,) the restoration of the proper nourishment, with the use of fresh vegetables and acids, invariably removes the symptoms, and they never commence where such diet can be obtained: while, in many cases of purpura, this diet has been taken abundantly, without the slightest alleviation of the complaint, and the disease has come on, where there had been no deficiency. "On the other hand, the rapidity of the..."
the attack, the acuteness of the pains in the internal cavities, the actual inflammatory symptoms that sometimes supervene, the occasional removal of the disease by spontaneous hemorrhage, the frequent relief derived from artificial discharges of blood, (see two cases of purpura by Dr. Parry, Edin. Med. and Surg. Journ. for Jan. 1829), and from purging, all tend to excite a suspicion that some local visceral congestion or obstruction is the cause of the symptoms in different instances." (Bateman's Practical Synopsis, of Cutan. Dif. p. 110.) Several facts in proof of these observations are stated in the work just quoted; but a sufficient number has not yet been collected to afford any general inference respecting the nature of the disease.

The cure of purpura is, therefore, not established upon any clear principle, and there has been considerable difference of opinion upon the subject. Dr. Willan has given a very imperfect view of this point. All that he says relative to the cure of the work's form of purpura, is comprised in these few lines. "In the treatment of this disease, we should recommend moderate exercise in the open air, a generous diet, and the free use of wine, Peruvian bark, vitriolic acid, &c. Without air, exercise, and an easy state of mind, the effect of medicines is very uncertain."

(On Cutan. Difeaes, p. 461.) Of this, indeed, he has given an ample proof in the next sentence, where he tells us that a patient "took for two or three months Peruvian bark in considerable quantities, the vitriolic and marine acid, and wine, without much advantage." In truth, the cure of purpura is, we believe, not to be effected by these means. In the lighter degrees of the disease, occurring in children who are ill fed and nursed, and excluded from the air and from all exercise, these toxes may seem to do good, when combined with air and exercise. "But," as Dr. Bateman observes, "when it occurs in adults, especially in those already enjoying the benefits of exercise in the air of the country, and who have suffered no privation in respect to diet; or when it appears in persons previously stout, or even plethora, when it is accompanied with a white and loaded tongue, a quick and somewhat sharp, though small, pulse, occasional chills and heats, and other symptoms of feverishness, however moderate;—symptoms which may be presumed to indicate the existence of some local congestion;—then the administration of tonic medicines, particularly of wine, cinchona, and other warm tonics, will be found efficacious, if not decidedly injurious. In febrile cases, free and repeated purgations of the bowels, by medicines containing some portion of the muriate of mercury, will be found most beneficial. The continuance or repetition of these evacuations must, of course, be regulated by their effects on the symptoms of the complaint, or on the general constitution; and by the appearance of the excretions from the intestines. If the pains are severe and fixed, and if the marks of febrile irritation are considerable, and the spontaneous hemorrhage not profuse, local or general blood-letting may doubtfully be employed with great benefit, especially in robust adults." Præct. Synopsis, before quoted, p. 114.

The importance of free purgeation in purpura has been clearly stated in a short but valuable communication from Dr. Harty, of Dublin, published in the Edinburgh Medical and Surgical Journal, for April, 1813: in more than a dozen cases treated in this manner by Dr. Harty, the hemorrhages ceased, and the purple spots disappeared, after a few doses of calomel and jalap had been taken. In the two cases related in the same useful journal by Dr. Parry, of Bath, before alluded to, and which were speedily cured by two bleedings from the arm, the blood drawn exhibited a tenacious contracted coagulum, covered with a thick coat of lymph, as in diseases of an inflammatory nature. The patients were a lady and an officer, the latter of whom was accustomed to free living; in both cases some degree of feverishness accompanied the purpura.

There is one variety of the disease, which Dr. Willan distinguished as a third species, by the title of purpura urticans, because the eruption commences in the form of rounded and reddish elevations of the cuticle, resembling the wheels of nettle-raft; but they are not accompanied by the same sensations, tingling and itching, which belong to the nettle-raft. These little tumours gradually dilate; but within one or two days they subside to the level of the surrounding cuticle, and at the same time their hue becomes darker and at length livid, or purple. As these spots are not permanent, but appear in succession in different places, they are commonly seen of different hues; the freshest and elevated ones being of a brighter red, while the level spots exhibit different degrees of lividity, and become brown as they disappear. They are most common on the legs, where they are frequently mixed with petechiae; but they sometimes appear on other parts of the body.

The duration of the purpura urticans is various, from three to five weeks, in the course of which time the hands and ankles are affected with edematous swellings: there is also a diathetic degree of languor and debility, and a loss of appetite, but seldom hemorrhage. It generally appears in summer and autumn, affecting those who are exposed to fatigue, and live upon poor diet, and delicate young women of indolent and luxurious habits. The same precepts, as to treatment, are applicable to this as to the other varieties of purpura.

When purple spots occur as symptomatic of bad fevers, they require no peculiar treatment. They are much less frequent concomitants of fevers than they were formerly; a circumstance which is probably to be ascribed partly to the more liberal use of purgatives at present in all febrile diseases, and partly to the more free admixture of fresh air, to the superior cleanliness, &c. now observed in these matters. The appearance of these spots has been occasionally noticed by various authors in agues, remittent fevers, palies, dropsy, and atrophy. Dr. Willan observes, that in the last stage of pulmonary consumption they sometimes occur as the immediate forerunners of death. (See Parry.) For histories and cases of purpura, see Duncan's Med. Cursier, vol. iii. and the Med. Cursier and Observ. p. 90. Annals of Medicine, vol. ii. Memoirs of the Med. Society of London, vol. iii. art. 20; and vol. iv. art. 17. Medical Tracts and Obs. vol. ii. Willan's Reports on the Diseases of London.

Purpurati, in our Ancient Historians, denote the sons of emperors and kings.

Purpure, Pourpre, or Purple, in Heraldry, according to fome, is one of the five colours of armories, mixed or compounded of gule and azure, bordering on violet; and, according to others, of a little black and much red colour. It is, by the heralds, supposed a symbol of temperance, liberality, dignity, authority, faith, and piety. Most authors in heraldry, as Favyne, Geliot, Monet, and Meneufier, do not allow purple for a colour, in regard it is not simple, but composed of a mixture of other colours. They rather esteem it a kind of intermediate tinture, sometimes metal, and sometimes colour; hence the Spaniards call it una misión; so that one cannot lay it on metal and colour without falsifying the arms.

Add, that many take the purple, as it is accounted, on many ancient bearings, by which fome of the moderns would evince
evince the regularity and legitimacy of this colour in armery, to be no other than silver tarnished.

Sperman, however, in his Apologia, allows purple the preference before all other colours, as having been an enigma of royalty for many ages; yet even he allows it to have been excluded, by the ancient heralds, as only an imperfect colour.

It is represented in engraving, by diagonal lines drawn from the finisher chief to the dexter base point. In the coats of noblemen it is called amethyst; and in those of princes, Mercury.

PURPURINA, a name used by Caneparius, and some other authors, for the aurum mosiacum, or aurum musium of the Persians, the present preparation of which differs from that of that author only in the proportions of the ingredients.

PURPURISSUS, in the Ancient Writers, both Greek and Roman, the name of a compound colour or focus of a fine purplish red, used to paint women's cheeks.

It seems by the composition to have been somewhat like our rose pink, as it is called by the colourmen. It was made of the creta argentaria, or fine white kind of chalk, disloved in a strong purple tincture of some of the roots of wood which dyed red; and when the coarser part was subdued to the bottom of the vessel, the liquor, while yet thick, was poured off into another vessel; and what subduced from this, which was as fine as flour, was of a beautiful pale purple, and was the purpurius favored for use.

Purrel, anno 35 Eliz. cap. 10, a lift ordained to be made at the ends of kerseys, to prevent deceit in diminishing their length.

Purrongur, in Geography, a town of Hindoostan, in the circuit of Burdwan; 20 miles S.E. of Burdwan.

Purrównah, a town of Hindoostan, in Oude; 28 miles E. of Goorapour. N. lat. 26° 57'. E. long. 84° 17'.

Purruch, a small circur of Bengal, about 16 miles in circumference; N. of Mauludah. Allo, a town of Bengal, and chief town of the said circur; 26 miles E.S.E. of Burdwan. N. lat. 25° 4'. E. long. 88° 25'.

Purshah, a town of Hindoostan, in Bahar; 18 miles N.W. of Chuprah.

Pursaummah, a town of Hindoostan, in Bahar; 35 miles E. of Durbungah.

Purse, a manner of accounting; or, as some call it, a species of money of account, much used in the Levant, particularly at Constantinople, where it is 500 apers; three apers being equal to a para, and forty paras equal to a piaitre, called by the Turks grouch, and by the English dollar. By the regulations of 1580, the purse of 500 piaitres was to weigh 2812.5 Turkish drams. A single piaitre weighed 52 drams, or 277 English grains; and the other pieces in proportion. Their standart of fineness was reduced at the same time to 50 carats (or hundredth parts) of fine silver, and 50 of alloy; which gave the value of the piaitre at 1934. shilling, and the other finenes in proportion. But since that period the Turkish coins have undergone a deterioration, so that a piaitre of the late coinage being weighed and assayed by the king's aljay master of the Mint, appeared to be in weight 8 dwt. 6 gr. In finenes, 5 oz. 6 dwt. worse than the English standard. This gives its fineness 47 carats 2 grains Turkish, and its value, in shilling, 13d. Kelly's Un. Cambill.

This money of account is called purse, because all the grand signior's treasure in the feraglio is kept in leather bags of this value.

In this, however, there is some difference; for the purse in Egypt is 25,000 medins, or 75,000 apers; and in other parts of Turkey it is only 20,000.

This method of accounting the Turks derive from the Greeks, and they from the Romans; the emperors of which brought it to Constantinople, as appears from a letter of Constantine to Cicilian, bishop of Carthage, quoted by Eusebius "Sct. Nichor. See Fossi."

Purse-Net is a Rural Economy, a net used for taking both hares and rabbits at certain times; and three or four of them are sufficient to lay over their holes: they are to be fastened, by tying strings to flocks thrust into the earth, otherwise when the rabbits bolt out, they will run away and get out of the nets; but when the nets are fixed, and all things are in order, there must be one or two persons to lie close, to see what game comes home; while, in the mean time, you beat the bushes, to force them homewards. But another way to take rabbits with these nets is, at their coming out of their paracres: and they should be secreted in this manner. First hunt them up and down, to force them all in, then put in a ferret, with a bell about her neck, which gives the rabbit notice of her coming, who, in endeavouring to avoid the ferret, runs into the net.

Purse, an officer aboard a man of war, appointed by the lords of the admiralty, who receives her victuals from the victualler; and is to take care that it be in good condition, and well laid up and flowed. He is also to see that they are carefully distributed to the officers and crew, according to the instructions which he has received from the commissioners of the navy for that purpose. To him also belongs the distribution of slops, &c.

He is also to keep a list of the men and boys belonging to the ship, and to set down, exactly, the day of each man's admittance into pay; that the paymaster or treasurer of the navy may issue out his disbursements, and pay off the men according to the muster-book.

Purpiveness, or Purvisness, among Farriers, thickness of wind, a name common to all those diseases in horses which arise from obstructions in the passages of the lungs.

Purpiveness, sometimes also called broken wind, may proceed from an ulcer, or some inward wasting of the lungs, in which the small vesicles are worn or abraded by the phlegm or acrimony of the common discharges.

The like disorder may also arise from a stagnation, hindering the air from penetrating so as to lift up the lungs in the act of respiration; or from some tough and mucilaginous matter separated in the branches of the wind-pipe.

The usual occasions are cold, surfeits, and other diseases not thoroughly carried off. Purvise disorders may also arise from unwholesome food, bad air, and hard riding when a horse is full. The signs are commonly a heaving and beating of the flanks; a wheezing and rattling. Sometimes the kernels about the throat will swell, and there will be a grunndulous running at the nose, which is the utmost stage of the disease, and usually reputed dangerous.

Purslane, in Botany. See Portulaca.

Purslane, Horse. See Trianthema.

Purslane, Sea. See Atriplex.

Purslane Tree. See Portulacaria.

Purslane, Water. See Pepsis.

Pursottumpour, in Geography, a town of Hindoostan, in Bahar; 35 miles W.S.W. of Arrah.

Pursoy, a town of Hindoostan, in Bahar; 35 miles W.S.W. of Gayah.

Pursivant. See Pursuivant.

Pursur, in Geography, a town of Hindoostan, in Oude; 13 miles N. of Mahomdy.

Purver, Anthony, in Biography, was born at Up-
Hurborn, in Hampshire, about the beginning of the 18th century. His education was extremely limited, but he exhibited a striking proof of his capacity for learning while he was very young; for, being prevented by illness from attending school almost six weeks, he applied, by himself, during that time, with such diligence and success to the study of arithmetic, that upon his return to school he was able to explain the precedents of evolution to his master, whose attainments had not carried him so far. At this time of life he exhibited great powers of memory, by committing to it twelve of the longest chapters in the Bible in as many hours. He was put apprentice to a shoemaker, who was also a dealer in sheep, and employed Anthony a good deal in looking after his flock. This was not by any means an irksome business, as it afforded him an opportunity for reading the Scriptures, to which he was particularly attached. As he advanced in years, he found that his favourite book contained doctrines that were very differently interpreted by different persons, and he was resolved to study the Old and New Testament in their original languages. Having renounced the occupation for which he was originally intended when he was about twenty years of age, he commenced teaching in a school, but afterwards removed to London, for the sake of more easily acquiring the means of prosecuting his studies. Here he probably refided in 1727, when he published his work, entitled "The Youths Delight." While at London he became a Quaker, and officiated among the friends in the character of a minister. He returned to Hurborn, and refumed his school in 1727, and probably continued it for some time, during which he began to translate the books of the Old Testament, from the original Hebrew. While thus employed, he felt it his duty to become a missionary, and travelled through several counties of the kingdom, till he came to Stambrook, near Bristol, towards the latter part of the year 1738. Here he refided at the house of a maltster, whose son he instructed in classical learning, while he devoted his leisure to his favourite employment of translating the Scriptures. In 1746 he made an attempt to publish his translation of the Old Testament in numbers; but for want of encouragement he did not proceed beyond two or three numbers. When he had completed the translation of the whole Bible, he could find no bookseller who would embark in the publication. Thus was the labour of thirty years likely to be lost, till Dr. Fothergill made him a present of 1000l. for the copy, and took upon himself the expense of printing the work. Under his auspices, it made its appearance in the year 1764, with the title of "A new and literal Translation of all the Books of the Old and New Testament, with Notes critical and explanatory," in 2 vols. folio. It was the author's intention to have published a second edition, with various corrections and alterations, but he did not live to accomplish the design. He died in 1777, about the age of 75. Purver was described by Dr. Fothergill as "a man of great simplicity of manners, regular conduct, and a modest reserve: he is readily attentive to truth, hates falsehood, and has an unconquerable aversion to vice; and to crown the portrait, he is not only greatly benevolent to mankind, but has a lively sense of the divine attributes, and a profound reverence of, and submission to, the Supreme Being." Gent. Mag.

PURITY. See POURVANCE.

PURVIEW. See PURVIEW.

PUS, from the French, pourrue, a gift, grant, provision, &c. a term frequently used, by Sir Edward Coke, for the body of an act of parliament, or that part which begins with Be it enacted, etc. as contradistinguished from the preamble.

The statute of 3 Hen. VII. stands upon a preamble and a purview. 12 Rep.

PURULENT, PURULENTUS, in Medicine, something mixed with, or partaking of, pus or matter.

Phthisical people frequently spit a purulent matter. In a dysentery, the stools are purulent: when there is an ulcer in the reins or bladder, the urine is purulent.

PURUSH, in Mythology. See PARISH.

Puruz, in Geography, a river of La Plata, which rises about S. lat. 17° 20', taking the name of "Rio Beni," and afterwards called "Amaru-Mayu," or "The Serpent," from S. lat. 12° its course is not ascertained till it comes to S. lat. 6°, after which it assumes the name of Puruz, and runs into the river of the Amazons, or Maranon, S. lat. 3° 44'. W. long. 45° 6'. Its whole course is northernly about 800 miles.

Purwar, a town of Hindoostan, in Lahore; 14 miles S. of Sialkot.

Purysburg, a handsome town of South Carolina, in Beaufort district, which district contains 25,887 inhabitants, on the E. side of Savannah river, 37 miles from the ocean, and 20 from Savannah. It derives its name from a Swiss, John Peter Purv, who settled a colony of his countrymen here about the year 1735, with a view to the culture of silk. The mulberry-trees are still standing, and some attention is paid to the raising of silk. The town contains between 40 and 50 dwelling-houses, and an episcopal church; 64 miles W.S.W. of Charleston. N. lat. 32° 24'. W. long. 81° 12'.

Pus, from mater, matter, the fluid contained in abscesses, and discharged from ulcerated surfaces, and sometimes from membranous surfaces which are merely inflamed, and quite free from ulceration, as is illustrated in cases of gonorrhea, empyema, etc. Pus is formed by a peculiar process, which is termed suppuration, of which we shall have occasion to speak in a future volume of this work.

In the present place, we shall content ourselves with inferring a few observations on the qualities and uses of pus, chiefly taken from the writings of Mr. Hunter.

True pus has certain properties, which, when taken singly, may belong to other secretions, but which, conjointly, form the peculiar character of this fluid, viz., globules swimming in a fluid, which is coagulable by a solution of sal ammoniac, which no other animal secretion is, and, at the same time, a confluence of inflammation.

The colour and the confidence of pus are the two qualities which first attract the notice of every, the most superficial, observer. The colour arises from the largest portion of this fluid being composed of very small round bodies, very much like those little globules which, swimming in a fluid, make cream. The fluid in which the globules of pus swim, we might at first suppose to be the serum of the blood, for it coagulates with heat, like the latter fluid. Pus is also probably mixed with a small quantity of coagulating lymph; as it partly coagulates after it is secreted.

The fluid part of pus, however, is known to have properties which ferum has not. There being a similarity between pus and milk, experiments have been made to ascertain whether the fluid of pus could be coagulated with the gallic juice of animals; but no coagulation could be effected in this manner: a solution of sal ammoniac made the fluid part of pus coagulate; but not any other secretion, or
PUS.

or natural fluid; and hence it was concluded, that whenever globules were found swimming in a fluid, coagulable by sal ammoniac, the matter was to be considered as pus.

The proportion which the white globules bear to the other parts of pus, depends on the health of the parts producing the discharge. When the globules are very abundant, the matter is thicker and whiter, and is called healthy pus; the meaning of which is, that the fluids, which produced it, are in good health; for these appearances in the matter are no more than the result of certain salutary processes going on in the fluids, the effect of which processes is to produce the disposition, on which both suppuration and granulation depend.

Pus is specifically heavier than water, and is probably about as heavy as blood.

Besides the above properties, pus has a sweetish mawkish taste, very different from that of most other secretions, and the same taste takes place, whether it is pus from a fore, or an irritated inflamed surface.

Pus has a smell in some degree peculiar to itself; but this differs in different cases. Some diseased, it is said, may be known by the smell, as, for instance, a gonorrhea.

Pus sinks in water; mucus floats. Pus communicates to water an uniformly troubled white colour; mucus gives the appearance of stringy portions floating in it. Mucus is said to be more readily disolved by sulphuric acid than pus is. It has also been asserted, that if water be added to such solutions, the pus is precipitated to the bottom of the vessel; while the mucus, instead of being completely precipitated, forms swimming flakes. A solution of caustic alkali dissolves both pus and mucus; but when water is added, the pus is said to become separated, but not the mucus.

Though solutions in chemical menstrua and precipitations have been thought a test of the distinction between these two fluids; yet the method has been thought absurd and unphilosophical. It has been conceived, that all animal substances whatever, when in solution, either in acids or alkalis, would be in the same state, and therefore, that the precipitation would be the same in all. Calcareous earth, when dissolved in muriatic acid, is in that acid in the same state, whether it has been dissolved from chalk, limestone, marble, or calcareous spar, and precipitations from all are the same. Hence experiments were made on organic animal matter, such as muscles, tendon, cartilage, liver, and brain; and on inorganic, such as pus and the white of an egg. All these substances were dissolved in sulphuric acid, and precipitated with the vegetable alkali. Each precipitation was examined with such magnifiers as plainly showed the forms of the precipitates, all which appeared to be flaky substances. The precipitate by the volatile alkali had exactly the same appearance. The same appearances were seen when the above kinds of animal matter were dissolved in the vegetable caustic alkali, and precipitated with the muriatic acid. A flaky substance, void of any regular form, composed each precipitate.

Pus does not irritate the particular surface which secretes it, though it may be irritating to any other. Hence no suppuring surface, of any specific kind, can be kept up by its own matter. If this had not been the case, no fore of a specific quality, or producing matter of an irritating kind, could ever have been healed. This is similar to every other secretion of stimulating fluids, as the bile, tears, &c., which fluids do not stimulate their own glands or ducts, but are capable of stimulating any other part of the body.

Whenever a real diseafed attacks either the suppuring surface, or the constitution, the production of true pus ceases, and the fluid becomes changed in some measure, in proportion to these morbid alterations. In general it becomes thinner and more transparent, and it partakes more of the nature of the blood, as is the case in most other secretions under similar circumstnaces. Særitis is the term usually applied by surgeons to pus in this degenerated state. This unhealthy sort of matter has more of the serum, and frequently more of the coagulating lymph in it, and less of the combination, which renders it coagulable by a solution of sal ammoniac. It has also a greater proportion of the extraneous parts of the blood, which are soluble in water, such as fats; and it has a greater tendency than true pus to become putrid. Such unhealthy matter may even be irritating to the surface which produces it.

The discharge, when of an irritating sort, is more stimulating to the adjoining parts with which it comes in contact, than to its own secreting surface. In this manner it frequently produces excoriation of the skin and ulceration. Thus the tears excoriates the skin of the cheek, in consequence of the quantity of fats which they contain. From this effect, matter has been called corrosive, a quality which it has not; the only property which it possesses being that of irritating the parts which it touches, so as to cause their absorption.

When the vessels thus lose the power of producing good pus, they also lose more or less the power of forming granulations. This may depend on some deviation from the due structure and action which such vessels should possess, in order to be qualified for the performance of these operations.

Pus, from several circumstances, would appear in general to have a greater tendency to putrefaction than the natural juices have; but, perhaps, this is not the case with pure pus, which, when first discharged from an abcesse, is commonly perfectly sweet. There are, however, some exceptions to this, but these depend on circumstances entirely foreign to the nature of pus itself. Thus, if the abcesse had any communication with the air, while the matter was confined in it; or if the collection has been so near the colon, or rectum, as to have been infected by the feces, then we cannot wonder that the matter should become putrid. When blood is blended with pus; when flous are mixed with it; when the parts forming the seat of the abcesse are in a gangrenous state from an erysipelas affection; the matter has a greater tendency to putrify than the pure pus discharged from sound abcesse, or healing sores. Pure matter, though easily rendered susceptible of change by extraneous additions, is in its own nature tolerably uniform and immutable. It appears so unchangeable, that we find it retained in abcesse for weeks, without having undergone any alteration. These qualities, however, only belong to perfect pus.

In the preceding paragraph it is stated, that matter remains very often unchanged in abcesse for weeks. This expression of Hunter's is not strictly correct; for it is well known, that the surfaces of the cavities of abcesse are always absorbing, as well as secreting ones; consequently there must be a continual mutation going on in the contained matter.

When there are diseased bones, or other extraneous bodies, exciting irritation, sometimes even to so great a degree as to make the vessels bleed, and often wounding the vessels of the part, the matter is always found to be very offensive. This state of the discharge is one mark of a diseased bone.

The
The discharge of an unhealthy sore blackens silver probes, and preparations of lead. This effect is imputed by Dr. Crawford to the sulphurated hydrogen gas generated in the matter. Phil. Trans. vol. lxxv. for the year 1790.

P. 291, &c.

Use of Pus.—By some it is supposed to carry off humours from the constitution. Suppuration is sometimes regarded as a constitutional disease, changed into a local one, which constitutional malady is discharged, or thrown out of the body, either in the form of pus, or together with this fluid. Critical abscesses have been thought to be cases of this sort. Suppuration has also been imagined to carry off local complaints from other parts of the body, on the old principle of derivation or revulsion. For this reason, fores or illies are made in found parts before allowing other sores to be dried up. Suppuration is sometimes excited with a view of making parts, such as indurated swellings, dissolve into pus; but we have endeavoured to shew that no dissolution of the solids is concerned in the production of pus.

A secretion of pus is looked upon as a general prevention of many, or of all, the cauæ of disease. Hence illies are made to keep off both universal as well as local diseases. However, the use of pus is perhaps unknown; for it is formed most perfectly from healthy sores, and in healthy constitutions; and large discharges from parts not very essential to life, produce very little change in the constitution, and as little upon being healed up, whatever some may suppose to the contrary.

This is certainly the case with many old ulcers, the suppuration from which seems to have little or no effect in impairing the health. Nor is there any real reason to be afraid of healing such ulcers, when possible, lest a worse disease should follow from the stopping of the discharge, to which the system is supposed to be habituated so much, that the continuance of such discharge is essential to health.

Every one knows, that when there is no interference of art, that is, when the surface of a sore is left uncovered, the thin part of the matter evaporates, and the thick part dries and forms a scab. Nature, therefore, seems to have designed, that one use of pus should be to make a cover or protection for ulcerated surfaces. Among the secondary uses of suppuration may be mentioned, opening a communication between a disease and the external surface of the body; forming a passage for the exit of extraneous bodies, &c.

PUS, in Geography, a town of Hindoostan, in Bahar; 32 miles E. of Hajjypour.

PUSBACH, a town of Germany, in the principality of Kulmbach; 12 miles S. of Kulmbach.

PUSCHENGA, a river of Russia, which rises in lake Urus, in the government of Archangel, and runs into the Pigna near Kevrol.

PUSCHIAVO, a town of Switzerland, in the Grisons, from which is derived the name of one of the jurisdictions ceded by the duke of Milan, in the year 1456. The greater number of the inhabitants confines of Roman Catholics. The town lies three miles N. of a lake of the same name, abounding in fish, and distant 14 miles S.W. of Bormio, and is situated 17 miles W.S.W. of the fame town, and 20 miles E. of Chiavenna.

PUSCHIMA, a town of Russia, in the government of Novgorod; 40 miles N.E. of Biebozerk.

PUSHAN, in Mythology, a name for Surya, a personification of the sun, among the Hindoos, and a name also of their god Siva.

PUSHENG, in Geography. See Kooshinje.

PUSHERS, a name given to Canary birds when new flown. See Brancher, and Canary bird.

PUSHING, in Geography, a considerable town of Persia, in the province of Khorasan, a little to the N. of Isfarrat, built on the banks of the Horroid, and celebrated for the beauty of the cypris trees which grow in its vicinity.

PUSHPADANVA, in Mythology, one of the names of the Hindoo deity Kama, the cupid of their mythology. It means with a flowery bow; his bow, which is made of a sugar cane, having its string composed of flowers and bees. See KAMA.

PUSHPAKA, the name of a flowery car, in which the Hindoo Plutus, named Kuvera, is conveyed. See KuVERA.

PUSILLATUM, a word used by some medical writers to express a coarse powder, or any medicinal substance, beat into small pieces for infusion, or the like purposes.

PUSTING, in Geography, a town of Hungary, on the Waag; eight miles N.N.W. of Leopoldstadt.

PUSTOMERZ, a town of Moravia, in the circle of Brunn; 16 miles N.E. of Brunn.

PUSTOZIRSK, a town of Russia, in the government of Archangel, near the Petchora. N. lat. 67° 15'. E. long. 51° 14'.

PUSTULE, PUSTULA, in Medicine, a small elevation of the cuticle, upon an inflated bafe, containing pus. Pustules originate from an inflammation of the skin, and the consequent partial effusion of purulent matter under the cuticle, by which the latter is elevated into small circumscribed tumours. Pustules are of various sizes, sometimes very minute, and sometimes extending to half an inch in diameter; and they terminate either in small ulcerations, or more commonly in scabby crusts. Dr. Willan constituted an order of cutaneous diseases under the head of pustules, including five genera, impetigo, perrigo, ecchyma, varioila, and scabies; but he never completed this part of his work, a brief compendium of which has been drawn up by Dr. Bateman. (See his Practical Synopsis of Cutaneous Diseases, 1813.) See also IMPETIGO, PERRIGO, SMALLPOX, and RITCH.

By many writers the use of the word pustule is very general, including not only purulent elevations of the skin, but vesicles and even pimples; and it must be admitted that the belief of authority has evinced even a more extensive acceptance of the word, including even wheels, “quæ ex urticâ vel fudore nascuntur.” (Cellus, lib. v. cap. 28.) But not only the etymology (qualis pus vularis), but accuracy of language would lead us to limit the term to pustules eruptions, as in the above definition, and as some correct writers have done. See Prof. Arnemann, Comment. de Aphantis. Linnaeus. Gen. Morbor. clav. xi. ord. 4, &c.

PUSTIVOLA, in Geography, a river of Asiatic Turkey, which runs into the sea of Marmora; 16 miles W. of Artaki, in the province of Natolia.

PUȘU, in Botany, the name of a famous plant growing in China, and greatly esteemed there. This and the ginseng these people a long time kept to themselves; but at length it was discovered, that the one was esteemed a certain prolonger of life, and the other a preservative against all diseases.

They, in their manner of speaking, say, that the puși gives immortality. We have not been so happy to obtain any of this famous plant for the trial, but the ginseng having been brought over, and found not to possess those great virtues they ascribe to it, and the people in China, who are possessed of the puși, dying, as well as those who have it not, we find, that the virtues of both are so greatly exaggerated.
exaggerated by the eastern dialect, that there is not much to be expected from them.

PUSULA, in Geography, a town of Sweden, in the province of Nyland: 37 miles N.N.W. of Helsingors.

PUT, in the Manege, called in French manege, is used for the breaking or managing of a horse: thus,

To put a horse to corsets, or caprioles, is to teach him those parts of the manege.

To put a horse upon his haunches, called in French affair, is to make him bend them handomely in galloping in the manege, or upon a flop. See HANChES.

To put a horse to the walk, trot, or gallop, is to make him walk, trot, or gallop.

To put a horse under the button, see BUTTON.

PUTAGE, Putagium, in our old La zo Books, denotes whoredom or fornication on the part of a woman.

The word is formed from the French putte, where: putagium, q. d. putam agere. "Quod autem generaliter follet dies, putagium hereditatem non admisce: ilium intelligatur off de putagio matris: quia illius hares legitimus est, quem nuptae demorantur." Glanv. lib. vii. cap. 12.

PUTALIA, in Geography. See PUTILL.

PUTALLOM, a town on the coast of Ceylon, near Calpenteen, remarkable for its salt-pans. This place, before the arrival of Europeans on the island, supplied the natives with salt; and on account of its convenient situation, was pitched upon by the Dutch for the manufacture of the salt with which they supplied the king of Candy's dominions, according to the articles of their treaty with him. The salt-pans are formed by an arm of the sea which overflows part of the country between Putallom and Calpenteen. A very large quantity of salt was manufactured here by the Dutch; they looked upon it as of the highest importance to their interests in the island, and the most formidable weapon which it was in their power to employ against the native king, as it was impossible for him to procure any but through their means. Since the British have obtained possession of the island, this manufacture has been almost entirely neglected. It is capable, however, of being rendered very profitable, as it is the only one of this kind on this side of the island, and the most conveniently situated for supplying the king of Candy's dominions. The Dutch enacted very severe laws to prevent individuals from manufacturing or trading in this article; the government taking upon itself the management of the works, and the care of supplying both its own subjects and the Candians. In order to keep a constant check on the latter, the Dutch were careful not to allow them too great a quantity at once; and whatever remained at Putallom, after supplying the demands of each year, they destroyed, that it might not be seized upon by forprife.

PUTANGES, a town of France, in the department of the Orne, and chief place of a canton, in the district of Argentan; nine miles N.W. of Argentan. The place contains 502, and the canton 11,934 inhabitants, on a territory of 212 square kilometres, in 31 communes.

PUTANISMO, Putanism, an Italian term, naturalized by some English writers, signifying whoredom, or the life or condition of a courtesan.

The word we borrow immediately from the French, putanisme; and they from the Italian putana, whore; of puta, girl.

PUTAO, in Geography, a town on the S. coast of the island of Lucon. S. lat. 13° 6'. E. long. 123° 28'.

PUTATIVE, Suppositive, something reputed to be what it really is not.

The word is seldom used but in the phrase putative father.

Thus we say, Joseph was the putative father of J esus Christ.

PUTAVERI, in Biography, a native of Otaheite, brought into France by the circumnavigator Bougainville: of whom a gentleman, who had refrided a considerable time in Italy, and was an excellent judge of music, affured us that the effects of French music, when fairly tried upon him immediately on his arrival, were not those of rapture, but ridicule. He danced to it, indeed, as we would to a marked measure beat on a drum or a table; for as soon as he returned from the great opera, whither he was carried, he mimicked what he had heard and seen in the most natural and ridiculous manner possible; giving the company a specimen of the French opera, which was the most admirable parody imaginable of French singing, or rather of the screams and howlings at the Académie Royale de la Musique in the time of Louis XV. Our friend wished to try the effects of Italian music upon this demi-favage native of Otaheite; but there was no opportunity, for how could it be properly executed at Paris? However, according to the late lord marshal, the experiment had been fairly made on another occasion.

A young Greek lady being brought from her own country to Paris, some years since, was, soon after her arrival in that city, carried to the opera by some French ladies, supposing, as she had never heard cultivated music, that she would be in raptures at it; but, contrary to those expectations, she declared that the singing only reminded her of the hideous howlings of the Calmuc Tartars, and as to the machinery, which it was thought would afford her great amusement, she proclaimed her dislike of many parts of it, and was particularly shocked by what she called the impious and wicked imitation of God's thunder. Soon after this experiment the went to Venice, where another trial was made on her unprejudiced ears, at an Italian opera, in which the famous Gi zziello sung, at whole performance she was quite disdoloved in pleasue, and was ever after passionately fond of Italian music.

PUTAWATAMES, or Pouototaries, in Geography, Indians who inhabit between St. Joseph's and Detroit in North America, and can furnish about 500 warriors. There are two tribes of this name, the one of the river St. Joseph, and the other of Huron. At the treaty of Green ville, Anguill 3d, 1795, they ceded lands to the United States, who paid them a sum of money, and engaged to give them goods to the value of 1000 dollars per annum, for ever.

PUTBUS, a town and fort of the island of Rugen; five miles S. of Bergen.

PUTCABARY, a town of Hindoostan, in Bengal; 145 miles S.E. of Moorheadabad.

PUTEA, in Ancient Geography, a town of Africa propria, S. of A dremutum, between Campan and Caraga, according to Ptolemy. Alba, a town of Syria, in the Palmyrene, between Orico and Ahada. Ptol.

PUTEAL, among the Romans, a small kind of edifice raised in the place where a thunder bolt had fallen. See BIDENTAL.

PUTELKAW, in Geography, a town of Prussia, in the province of Ermland; six miles S.W. of Flauen burg.

PUTEMAHRY, a town of Hindoostan, in Bengal; 16 miles N. of Kifhanagur.

PUTEOLANUS Fulvis. See POZZOLANA.

PUTHLOSE, or PUTLOS, in Geography, a town of the duchy of Holstein; four miles N.W. of Oldenburg.

PUTI, or Potti, a town of the principality of Guriel, at
at the mouth of the Rione, on the Black sea; 80 miles W.S.W. of Cotatis. N. lat. 42°. E. long. 41° 28'.

PUTICULI, among the Romans, ditches or holes in the earth, a little without the Equiline gate, in which the poorer fort of people were buried.

PUTIGNANO, in Geography, a town of Naples, in the province of Bari; 33 miles S.E. of Bari.

PUTIVLI, a town of Russia, in the government of Kuril, on the Sem; 72 miles W.S.W. of Kuril. N. lat. 51° 20'. E. long. 34° 14'.

PUTLACH, a town of Bavaria, in the bishopric of Bamberg; five miles E. of Gollweinstein.

PUTLITZ, or Putlitz, a town of Brandenburg, in the Mark of Pregnitz; 10 miles N. of Perleberg. N. lat. 53° 16'. E. long. 12° 5'.

PUTLEGS, or Putlocks, in Building, short pieces of timber, about seven feet long, used in building scaffolds. They lie at right angles to the wall, with one of their ends bearing upon it, and the other upon the ledges or poles which stand parallel to the side of the wall of the building.

PUTNA, in Geography, a town of Moldavia; 32 miles W. of Suceava.—Also, a river of Moldavia, which runs into the Mileau, at Focană.

PUTNAM, a county of America, in the southern district of Georgia, containing 6800 free persons, and 3220 slaves. Its chief town is Eatonton.

PUTNEY, a town of America, in Windham county, and state of Vermont, containing 1667 inhabitants.

PUTNEY, a village and parish in the west half hundred of Brixton, and county of Surrey, England, is situated on the south bank of the river Thames, at the distance of four miles from Hyde Park corner, London. The parish contains 1630 acres, of which the greater proportion is an open common or heath. In the time of the civil wars it was the scene of some very interesting transfigurations. The parliamentary army lay at Putney, for a considerable time, in the year 1647; and here the general officers, after long debates in the church, completed their propositions for the future government of the kingdom, and sent them to the king at Hampton Court. Here also were born two celebrated statesmen, Nicholas Wilt, bishop of Ely, and Thomas Cromwell, earl of Effex, the protector of Wolsey, and the successor to his power and misfortunes. In this parish are many agreeable villas; in one of which the late illustrious William Pitt breathed his last. The church was originally built as a chapel of ease to Wimbledon, not long after the conquest; but was, in a great measure, re-erected in the reign of Henry VII. It is a small edifice, with a low tower at the eastern extremity of the south aisle, built by bishop Wilt, is, however, its chief ornament. Monuments and inscriptions are numerous, but few of them deserve notice. Over the Thames, in this parish, is a wooden bridge, constructed in the year 1729, at the expense of 23,975l. and yielding a revenue, by tolls, to the proprietors of about 3000l. per annum. A fishery here was possessed by the lord of the manor, previous to the conquest; and is now rented for a considerable sum. All horsemen and porpuses are claimed by the lord mayor of London, but the fishermen receive 5s. for each of the former, and a guinea for each of the latter, when delivered to the water bailiff. On the common stands an obelisk, erected, in 1756, in memory of Hartley's invention for extinguishing buildings against fire.


PUTNOK, a town of Hungary; 36 miles W.N.W. of Tokay.

PUTORIUS, in Zoology, the Pole-cat, a species of Mustela; which see. See also Pole-cat.

Putorius Serpens, a name given by some to that species of serpent called by others drymum.

PUTREFACTION, or Putrification, in Chemistry, is a species of fermentation (which see); being the last stage of the fermentative processes, and connoting not merely in the decomposition and transposition of the particles of putrefying substanstances, whether animal or vegetable, by which new combinations are produced, but also in the extraction and expulsion of some of the constituent parts of the substanstances.

This decomposition or derangement of the constituent parts of vegetable substanstances is usually called fermentation, and that of animal bodies, is denominated putrefaction. The agents that produce both kinds of decomposition, and the circumstances that attend them are, in various respects, very similar, and the chief difference of the products that are obtained from both depends upon the diversity of their constituent parts. The process of putrefaction, and its effect in dissolving the combination of the constituent parts of bodies, are sufficiently obvious to feme; but the rationale of the process, and the mode in which gaseous and volatile compounds are separated from bodies that are disorganized and afterwards form new combinations, are still involved in considerable obscurity; and different writers have disagreed in their explication of them. Several facts, however, are universally acknowledged; and of these we shall give a brief account in the sequel of this article, together with a detail of some of those principles and theories that have been adopted for explaining them. Becher long ago observed, in his "Phys. Subt. l. i. §. 5," that air is the principal agent of decomposition, but that water and heat very much facilitate its action. Thus he says, "Fermentation ergo definitur quod sit corporis denfioris rarefacio, particularumque aerarum interpoftio; ex quo concluditur debere in aere fieri nec nimum frigidum, nec rarefacio impediatum; nec nimum calido, ne partes raribiles expellantur."

An animal substanstance may be preferred from putrefaction by depriving it of the contact of the air; and this process may be accelerated or retarded by varying or modifying the purity of the same fluid. When we observe putrefaction occurring without the access of atmospheric air, the effect is produced by the water which impregnates the animal substanstance, becomes decomposed, and affords the element and the agent of putrefaction. Hence it appears, that moisture is an indispensible requisite to facilitate putrefaction. A moderate degree of heat is also a condition favourable to animal decomposition.

Dr. Hales, it is well known, ascribed the cohesion and solidity of bodies to the air, which exils in them in a fixed state, and forms, as he expresses it, the cement or bond of union between their several constituent particles. To this purpose he observes, that air abounds much more in solid than in liquid bodies; and that solid bodies being generally denser than water, the attraction of the air of those solid bodies in a fixed state, and its repulsion when in a liquid state, are greater than the attraction and repulsion of the lighter weight particles in a fixed and in an elastic state; and hence the particles of air are fitter to be the principal bond of union in solid bodies, than the particles of water. This opinion was afterwards adopted by baron de Haller, who maintains, that air is the vinculum elementorum primarium, or the true cement which binds together the earthy particles
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particles of bodies. Mr. Macbride, as we have elsewhere shewn, has taken occasion, by a variety of experiments, to illustrate and establish this opinion; and in support of it he alleges, that the preservation of firmness and soundness in bodies depends on restraining the escape of that principle, since known by the name of fixed air, and which he supposes to be the immediate cause of cohesion: for the moment it flies off and refumes its effulgence, the other constituent particles, viz. the earthy, the saline, the oily or inflammable, and the aqueous, being thereby put in motion, immediately begin to exert their several peculiar attractive and repulsive powers, and run into new combinations, which first change, and at length altogether destroy the texture of the substance they formerly composed; provided that this substance contained in itself a sufficient quantity of water to allow of the interline motion, by giving the proper degree of fluidity; for without fluidity there can be no interline motion; and without interline motion there can be no change of combination: because we see that fish and vegetable bodies are as suddenly deprived of their water, or, generally, contain very little, are almost as durable and unchangeable in their texture as minerals. Hence Acosta observes, that in Peru, and others have observed the fame in Egypt, where it very rarely rains, every thing will continue a long time uncorrupted; unless we should rather ascribe this effect to the abundance of nitrous falt in the air of those places, which is known to refit putrefaction. Indeed all putrefactions, both of animal and vegetable bodies, are affirmed by the learned Boerhaave to be performed by means of water alone. Take, says he, a pound of fresh flesh, and keep it in a heat like that of our body, and, in a few days the putrefaction will be completed; but if you first drain out, or exhale, all the watery part from the fame in some chemical vessel, though the fat and oil remain, the flesh will harden like a stone, and may be kept for ages without putrefaction. Though when thus hardened, water poured on it, or even the common dew, will soon fet it a putrefying. Thus Villaris and Cazalet of Bourdeaux, as Chapital informs us, dried meat by means of fives, which was preferred for several years without contracting any bad flavour.

By such means, bread, flesh, or the like foods, may be preferred for many ages; provided regard be had to the place. Hence it is that in dry countries, as Egypt, dead carcases never putrefy, but dry and harden uncorrupted: as we see also in the mummies found buried under the sand.

The sands and light porous earths preferve human bodies by exhausting their juices and drying the solid parts. Hence it is, that thare carasses have been discovered in Arabia, confelling of men and camels, preferred in the sands under which the impetuous winds have buried them. In the library of Trinity college, Cambridge, a human body may be seen in a perfect state, which was found under the sand in the island of Teneriffe. Hence putrefacions putrefy much more slowly when exposed to a drying wind, than in a sheltered place.

Nevertheles, too much humidity impedes putrefaction. To this purpose Becher observes: "Nimia quoque humiditas a putrefacione impedit, prout nimius calor; nam corpora in aqua potius gradatim confummi quam putrefecerit, fi nova fumer affluens sit, experientia docet: unde longo tempore integra interdum submersa profuerat a putrefacione immuniam vidimus; adeo ut nobis aliquid speculatio occurreret, tractando tali modo cadavera anatomico subducti, quod duxit a factore et putrefacione immunia forest." Accordingly it is necessary, that in order to a body's putrefying by moisture, that the water should impregnate but not inundate it. It is also necessary, that it should remain in the texture of the animal body, without being renewed; for thus the lymph is diffused, and the mot putrefiable substance is presented to the air with the greatest extent of surface; and the water itself is decomposed, and by this means affords the putrefactive principle.

Even human blood, which, naturally, is so prone to putrefaction, if you deprive it of its watery part, may be kept for fifty years. Goat's blood, we actually find kept fo long in the shops, without corrupting; though, if you diffuse it in water, and expose it to a gentle warmth, it will putrefy immediately. Blood is said to be the most putrefactive substance, as is known; and this property is ascribed partly to its fluidity and partly to the large quantity of fibrin and uncondensed albumen, which it contains, and especially to the former. See Blood.

We shall here add, that animal substances seem to be (ceteris paribus) more putrefact in proportion to the number of constituent parts which they contain. The substances either absolutely or nearly imputrefiable are bone and condensed albumen, the latter being such as exsils in cuticle, nail, hair, &c. which long remain unaltered in the midle of putrefying substances. Animal oil also putrefies with great difficulty, and hence the people that live in the most northern parts of America, the Equinoxians and others, preferve fish and meat to a certain degree from putrefaction by immersion in fish-oil.

In putrefaction there is a great intestine motion, which, when carried to an extreme, and when the putrefying substance is much comprized, is accompanied with heat and smoke, and sometimes flame. However, M. Beaumé affirms, that putrefaction is not attended with any sensible heat: when, indeed, it proceeds slowly, and the quantity of putrefying matter is but small, the heat, if any, is very little. That putrefactive substances emit light, is an unquestionable fect; and on this principle philosophers account for the luminousness of the fea, the ignis fatuus, &c. To this purpose M. Ant. Martin (Swed. Abbad. vol. xxiii. p. 255, cited by Dr. Priestley, in his History of Light, &c. p. 576;) observes, that human bodies have sometimes emitted light about the time they begin to putrefy; and that the walls and roof of a place in which dead bodies had often been exposed, had a kind of dew or clammines upon them, which was sometimes luminous. And he imagines, that the lights which are said to be seen in burning grounds may be owing to this cause. It has been observed, that heat extinguishes the light of putrefact substances; Mr. Canton, attending to this circumstance in some experiments for ascertaining the cause of the luminousnes of the sea, remarks, that though the greatest summerheat is well known to promote putrefactions, yet twenty degrees more than that of the human body would hinder it; for putting a small piece of luminous fish into a thin glass ball, he found that water of the heat of one hundred and eighteen degrees would extinguish its light in less than half a minute; but that on taking it out of the water, it would begin to recover its light in about ten seconds: but it was never afterwards so bright as before. See Light.

It has been observed, that a temperature from about forty degrees to the highest natural heat is favourable to the putrefaction of animal matter, whereas a freezing temperature is known to stop putrefaction, as it is the custom in cold countries to bring victuals frozen to market, and in this state they are kept for any length of time without any other preparation; and besides, bodies of men or of other animals remain unaltered under ice for many weeks. We
might allege many other circumstances of a similar nature. On the other hand, a scorching heat also prevents putrefaction; probably by expelling the moisture which is essential to the process, because by an inferior degree of heat putrefaction is promoted. The influence of temperature on animal putrefaction is thus stated by Becher: "Aer calidus et humidos maxime et putrefactionem facit—corpora frigida et secus difficiliter, imo aliqua proprus non putreunt; quae ab imperitis proinde pro fanitis habita fuerit; ita a aer frigido et secus, imprimis calidus et secus, a putrefactione quoque praeferunt; quod in Hispania videmus, et locis alibi calida, frigida. calidis aer cum retineatur, ubi corpora non poterunt et refolviis; nam cadavera in oriente in arena, imo apud nos arte in fornas, eccari, et sic ad fines mundi utque a putredine praeferant, certum est: intemperatrum foetis quae frigus a putredine praeferant unde corpora Stockholme tota hyeme in patibulo suprema fine putredine animadvertimus." From the facts already stated, we may deduce the most effectual means of preventing, and increasing putrefaction, and also of modifying it at pleasure. A body may be preserved from putrefaction by depriving it of the contact of atmospheric air; for this purpose nothing more is required than to place the body in a vacuum, or to envelope it in a covering, which may defend it from the immediate action of air; or also to envelope it in an atmosphere of some gaseous substance, which does not contain vital air. Putrefaction may also be favoured by keeping bodies at a suitable temperature. A degree of heat from between sixty-five and ninety degrees diminishes the adhesion of the parts, and favours the action of the air; but if the heat be greater, says Chaptal, it volatilizes the aqueous principle, dries the solids, and retards the putrefaction. Hence it is inferred, that for the decomposition of an animal substance, it is necessary that it should have the contact of atmospheric air, and that the purer the air is, the more speedily will the putrefaction: that it be exposed to a moderate degree of heat: and that its texture be impregnated with humidity.

The most sudden and remarkable changes produced upon a body by putrefaction, are upon its colour, smell, and taste. Flesh beginning to putrefy, is well known to exhale very soon after a penetrating fetid smell, its colour becomes paler, then inclining to blue, and afterwards livid and black, and its taste nauseous. Transparent liquor, as urine and broth, during putrefaction, becomes also turbid: as the putrefaction advances, the smell becomes more and more fetid, and it also acquires great pungency, which is caused by a large quantity of volatile alkalies, diffused from those substances that are completely putrefied. Solid bodies, whilst they are putrefying, will become soft, lose the cohesion of their parts, and are lastly reduced to a very disagreeable putrid pulp, mafs: the fluids become turbid, and the effluvia are loathsome and thickening, and after a time a putrid gas is diffused in a slow but sensible effervescence. A foul and brown serum then sweats out from the pulp mafs, and about this time the effluvia is very feebly ammonic, which is indicated by its effects on the eyes and throat, and by forming a white vapour with muriatic acid gas. For some time a large part of the putrid sub stance is evaporated, and carried off in the putrid gas and diffused in the atmosphere, after which the extreme factor sublimes; and finally the products of putrefaction cease, and leaves a kind of fat fetid earthy matter. All the gases certainly known to be produced by putrefaction, are carbonic acid, carbonated hydrogen, sulphuretted and phosphuretted hydrogen, and ammonia; but either these, or some of these, must be considerably changed by the solution of the animal matter; or some compound not yet examined, must be produced in that state of putrefaction, when the gas evoluted occasions such dreadful effects upon those that have the misfortune to fall in the way of it, even when diluted considerably with common air. This is said to be the case when the abdomen of a large animal is first burst, after some days or perhaps weeks of putrefaction; the gas from which causes instant fainting, and sometimes death, and even when the person exposed to it receives the first shock, it leaves excessive debility and other alarming symptoms for a considerable time. The most deleterious gas that is known, is perhaps, carbonated hydrogen, but the effects of this, as obtained by chemical means, are far short of those above-mentioned, when equally diluted. The generation of ammonia has been satisfactorily accounted for, since the discovery of the constituent parts of the volatile alkalies, by the new combination formed between the azote of the animal matter, and the hydrogen, of which latter there are many fources, and particularly that of the decomposition of water. As ammonia is always produced during putrefaction, it seems rational to suppose that one important purpose of the moiture necessary to the process, is to afford, by its decomposition, the hydrogen of the volatile alkalies. The nitrous acid is also an undoubted product of putrefaction; but further experiments and facts are necessary for explaining the reason, why in some cases the azote tends to unite with oxygen to form this acid, and in others with hydrogen to form ammonia. For an account of the peculiar changes which animal flesh undergoes, by which it is converted into a fermentablelike substance, instead of passing through the usual process of putrid decomposition, we refer to the article Aminciren.

Sir John Pringle has observed, that, as all the humours of all animal bodies become thinner by putrefaction, so the solid or fibrous parts are thereby relaxed, and rendered more tender: and hence the extraordinary bulk of the heart, liver, and spleen, incident to persons labouring under putrid diseases, may be accounted for. It is remarkable, that in defecpions of persons who die of the plague, the heart is almost always found of an uncommon magnitude; and as to the scurvy, the liver and spleen are sometimes enlarged to such a degree, that the tumour may be seen outwardly.

From matters completely putrefied may be obtained by distillation volatile alkalies, some liquid and some solid; a pungent fetid oil, which at first is thin, and afterwards becomes more thick; and a residuum of coal, not easily reducible to ashes. Some writers on this subject have apprehended, that putrid substances are not to be regarded as alkalines. Sir John Pringle, finding from the experiments which he made in the year 1759, that fyrup of violets was not changed into a green colour by the ferum of putrid blood; that this ferum did not make any effervescence, when spirit of vitriol was poured upon it; that water, in which corrupted flesh had been for some time infused, neither effervesced nor changed the colour of the fyrup; and that alkaline salts, both fixed and volatile, powerfully oppose putrefaction; was led to adopt this opinion. But when he became acquainted with the experiments made by M. J. Bapt. Gaber of Turin (Aucta Taurinens. vol. i. p. 78, &c.) he was convinced with the liberality of a true philosopher, the first opportunity of acknowledging his mistake. M. Gaber, having poured a drop or two of aqua fortis upon bile, taken out of the gall-bladder of a person who had died of an infe rvere jaudice without a fever, and whose body had lain about twenty-four hours in a cold place in winter, found, that the mixture immediately effervesced, became feebly warm, and that several air-bubbles rose to the surface. He also exposed the remainder of this bile in three open glasses

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to the thirty-fifth, twenty-fifth, and tenth degrees of heat, indicated by Reaumur's thermometer, and at the end of twenty-four hours mixed them with acids; and he found, that the bile which had been placed in a degree of heat answerine to thirty-five, was most dilated, and gave very slight indications of effervescence; that which had stood in twenty-five was also dilated, and the acid produced a more sensible effervescence, but still very slight; and the bile which had been exposed only to the temperaturn of the air, varying from seven to ten, preferred its tenacity, and fermented as much as that in his first experiment. Having mixed some blood, taken out of a vein of the dead body at the same time, and which appeared to be of the yellowish-red, with spirit of nitre, the mixture effervesced, but in a much less degree than the bile: this mixture, being left to digest for some hours, a yellow serum separated from the blood, and covered its whole surface; and the blood, being subjected to the same heat as the bile, and for the same time, appeared more disposed to effervescence than the bile, though this disposition afterwards gradually diminished. From these experiments the ingenious writer infers, that in diseased bodies the humours may become fo alkaline as to effervesc with acids: that a very slight degree of putrefaction and putrefaction, which is not sufficient to produce alkali out of the body, will produce it in the body; that alkali formed in the body, and contained in the bile, is extremely volatile, since the heat of twenty-five degrees made a great part of it evaporate; and that the same alkali contained in the blood, being a little more entangled with other elements, is consequently less volatile, since the same degree of heat continued for the same time, dissipated but a very inconsiderable part of it: and, therefore, that the different phenomena taken notice of by those who have prosecuted experiments of this kind, some of whom affirm that they have been undoubted proofs of the presence of an alkali, and others that they have scarcely discovered any such indications at all, are the effects of different degrees of heat, the likeness of the substance exposed to the heat, or the different volatility of the alkali arising from its cohesion with other principles. Having made similar experiments upon healthy bile, blood, and serum, and submitted them to the action of mineral acids, he found the bile most disposed to effervescence; that human bile was more disposed to effervescence than the bile of an ox; that corrupt blood ferments with acids still flow; and that serum ferments slower than blood. He also observed, that putrefactive humour not only effervesced with mineral acids, but with very weak distilled vinegar; and that those humours that have been exposed to artificial heat, become fixed and effervescence lost, and soon arrive at the flat stage of fermentation; in which case the fermentation ceases, though the heat is continued; and the smell, which till then is intolerably fixed, becomes herbaceous, and is not disagreeable. The father, he says, manifeseth itself sooner and lasts longer than the alkali.

M. Gaber further observes, in relation to the experiments of Sir John Pringle, that at the degree of heat to which he exposed putrefactive substances, and which was equal to the hundredth degree of Fahrenheit, corresponding nearly to the thirtieth degree of Reaumur, animal humours very soon become putrid; but that they as soon lose the alakefence which they derive from putrefaction, if this degree of heat is continued: so that as the corrupting humours manifest their alakefcent quality only for a very short time, it might easily happen that no sign of alakefence appeared in his experiment, if it was not made in the critical moment, i.e., if he examined the putrefactive humours a little before the alkali was formed, or a little after it had evaporated. And he, therefore, apprehends, that if Sir John Pringle's experiments were made with a degree of heat just equal to his own, the result, ceteris paribus, must have been the same.

From other experiments this writer infers, that blood received from the arm, agitated and left to putrefy, does not putrefy so soon, nor so soon manifest signs of alakefence, as the red part separated from the serum, because the serum putrefies more slowly than any other animal humour; and that the alkali, which evaporates with a degree of heat from twenty-five to twenty-eight of Reaumur, being collected in a receiver, will effervescence, and that the residuum is a mass extremely fixed, wholly diftilted of alkali, and, consequently, that no effervescence is to be expected by pouring acids upon it. Having kept some blood in a glass vessel close stopped, he found that it retained its alakefence a long time, though exposed to a degree of heat equal to twenty-five; but upon unstopriing the vessel, it flew off with great violence, in an extremely fixed vapour. These explosions he attributes to the expansion of the air, in consequence of the putrefaction; and hence he deduces the reason, why the humours that are contained in the veins of a human body become alakefcent while they are yet scarcely fixed, although when drawn from the body, and kept in open vessels, they become fixed, before they give signs of alakefence. As soon as they begin to form alkali in the vessels, the alkali is retained; but as it exahles from vessels exposed to the air, a greater quantity must be formed than exahles before it can become sensible. Having collected the distilled liquor of blood in such a state of putrefaction as to effervescence with acids, and exposed it to the action of various acids, a violent effervescence ensued; and when poured upon syrup of violets, it produced as fine a green as sprits of hartshorn; and this tinture, having been changed into a red by the effusion of a few drops of aqua fortis, became again blue, upon pouring into it some more of the distilled liquor: whence he concludes, that putrefactive humours form a true alkali, which exahles with a very slight heat. From other experiments he infers, that the alkali of putrefactive substances is not the productive cause of their factor, because the latter remains when the former is departed. But as both appear in the same degree of heat, when long continued, it appears, he says, that this factor is produced by the effluvia of parts extremely volatile, but different from volatile alkali, which, though sooner produced, are more slowly dissipated. Alakefcence, however, may be sometimes connected with a flight factor; and, on the contrary, extreme factor may subsist without alakefcence. And this fact confirms the observation of Sir John Pringle, who found a difference between the fixed and alakefcent particles; since the exhalations of fresh urine are not pernicious, though they contain more alkali than any substance in a state of putrefaction, the odour of which is pungent in the highest degree; and, therefore, putrefactive effluvia are of a different nature from alakefcent salts. M. Gaber further adds, by way of inference from this fact, that a volatile alkali is not a necessary product of putrefaction, and that the degree of alakefence is not equal to that of putrefaction. Dr. Croll, professor of chemistry at Brunswick, has objected to this doctrine, as not conformable to the phenomena (Phil. Trans. vol. lxi. part i. art. 29.) for he supposes, that as all smell depends on a saline matter joined with phlogiston, and the saline matter producing the putrid fæces was very probably not an acid, it must be a volatile alkali, which, involved in phlogistic matter, might fly off before the alkali was developed. From some experiments made with a view of ascertaining this fact, he infers that the volatile alkali is present as long as, at least, as the putrid smell continues, and that this volatile alkali is the basis of it; because, as this was
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distilled over in his experiments, the residue, being still in intelline motion, required only the herbaceous smell. The
reason why the volatile alkali has been distinctly observed at a certain period of putrefaction, and not in the other, he
apprehends to be this: the volatile alkali has, it seems, a tendency to difentangle itself, by intelline motion, of all
such matter as it is involved with; but if it is not combined with fuch matter as retains it till it has gone through all
its evolutions, it is, being itself volatile, carried off by the
still more volatile phlogistic matter with which it is commonly
joined. For this reason, he supposes the putrefying matter
flows in its beginning no signs of volatile alkali, because its
smell depends only on those particles which have been on
the surface, without any strong cohesion with the subfance.
In the further progres of putrefaction, the matter involving
the alkali, or fumming it, is intermixed, and in connection with
the folid particles of the subfance, and is by these means
reftained till the alkali is come to its purer state. Towards
the end of putrefaction, the cohesion of the particles being
almost entirely taken off, the volatile alkali is carried off before
it can go through all its fates.

Dr. Macbride made several experiments with putrid blood
and putrid bile, which aften the fact, that as soon as an
animal subfance begins to putrefy, it begins to difcover an
alkaline quality; and this volatile matter, now produced in
it, may be feparated by fiffillation in a very gentle warmth;
but he observes, that the volatile alkali obtained from putrid
subfances is not exactly similar to that obtained by
violent heat from animal subfances not putrid. It difters
remarkably in the flavour, which is naufeous and disagreeable,
is not fo pungent, and is much weaker than the common
volatile alkali; and this latter is capable of difpoifling the
putrid alkali, and of driving it off from any body to which
it has been united. But to return from this digrefion. As
to the caufe and procefs of putrefaction, it has been generally
believed, that the contact of atmosfherical air is neceffary
for this purpofe, and that bodies become putrid, because air
communicates fomewhat to them: accordingly it has been
alleged, that bodies buried deep under the earth, or in
water, out of the reach of any air, have remained entire for
ages; which, when exposed to the open air, have soon
rotted and mouldered away. It is aliowell known, that
bodies are preferved from putrefaction by covering them with
wax, fuc, &c.; and Mr. Boyle relates, that he has preferved
lemons, oranges, and other fruits, from putrefaction, during
feveral years, by including them in an exhausted receiver.
Experiments of the fame kind have been lately made by
M. Eller of Berlin, which show that subfances, even of the
most putrefent nature (fuch as blood) may be kept
found in vacuo for many years. But Dr. Macbride has
urged a variety of facts and confiderations to prove, that
putrefaction ensues in confequence of the loss of fome
principle, which cemented the confluent particles of bodies,
and that, when this is difeigned from them, they separate,
and are difinte. This principle he difcovered to be air,
which, in putrefaction and fermentation, is extricated and
thrown off, from a fixed and non-elastic flate, into one that
is volatile and elastic; but which immediately, upon meeting
with a proper recipient, returns again to its former nature.
Thus he found, that caufeful alkali and quicklime may be
rendered mild by afsorbing this air, extricated from putrefy-
ing and fermenting subfances; that without the eftinction of
this air no putrefaction can happen; and that even by ab-
sorption of it, putrefied subfances may be corrected and
rendered fweet. To the fame purpofe Dr. Alexander has
endeavoured to prove, that putrid matter will preferve other
subfances from putrefaction; which is not improbable,
caufe, being already faturated with the putrid effluvium,
they cannot readily take any more. Dr. Macbride, having
expofed putrid matter to the vapours arising from ferment-
ating mixtures, or from alkaline subfances effervescing with
acids, found that the putrid quality was destroyed; and
hence he confiders the fixed air as powerfully antifeptic.
And it appears alfo from the experiments of Dr. Priestley,
that fixed air corrects and renders wholefome air tainted with
repiration or putrefaction. Hence he infers, that lime-kilns,
which difcharge great quantities of this air, may be wholefome
in the neighbourhood of populous towns, the atmoferph of
which mult abound with putrid effluvia. Sir William Lee, in
a hot feafon, contrived, by impregnating water with fixed air,
in the manner defcribed under Pyromont Water, and waffling
meat with it two or three times a-day, not only to preferv et
it as perfectly fweet and good to the extent of ten days, as
at the firft killing, but alfo to recover fome meat that had
begun to change. And it is farther well known, that fixed
air, or carbonic acid, has been lately introduced into the materia
medica, and administered with fuccefs in a variety of putrid
cafes. Dr. Macbride has alfo proved, that putrefaction is
accelerated by taking off the prefure of the atmoferph;
and from fome experiments he was led to conclude, that it will
take place sooner in vacuo than in the open air; but making
a more complete vacuum by means of two brafs hemifpheres
joined together, he found that the observation of Mr. Boyle
and others was agreeable to fect. It appeared alfo, by in-
cluding flefh in condenfed air, that increasing the prefure
of the surrounded air, retarded putrefaction; and hence he
deduces, what he deems to be a demonstrative proof, that
bodies do not putrefy, because the air adds fomething to
them; for if they did, then a piece of flefh which lay in
condenfed air ought to have putrefied the sooner, becaufe it
had the greater quantity of air applied to its surface. But
the reafon why, according to his fystem, condenfed air pre-
vents putrefaction is, that the prefure of every fide muft force
the confluent particles clofter together, thus increase their
cohesion, and prevent the intelline motion; and without
intelline motion there can be no change of combination.
However, it is observed by Sir John Pringle, that the putre-
facition of meat and other subfances, advances quicker in a
confined than free air; for as the most putrid parts are alfo
the moft fugitive, they infcinually sifh from a corruptible
subfance, and difpefe with the wind; but in a stagnation
of air they remain about the body, and in the nature of a
ferment excite its corruption.

It has been long obferved, that putrefaction generates air.
Hence, though flefh, as well as blood, be specificly heav-
ier than water, yet dead bodies are found to float, after
lying some time at the bottom, from air generated in the
bowels by putrefaction. And since it has been found by
experiments, that the blood and other animal subfances
begin to emit air before they are fo far corrupted, as they
frequently are in putrid difeafes, it is probable that feveral
of the symptoms in deep furfets may be owing to the action
of the confined air. As dead bodies become putrid from
the loss of their fixed air, according to Dr. Macbride's
theory, he fuggetts, that the immediate caufe of putrefa-
cion in living bodies may be the detachment of too large a pro-
port of their fixed air. This principle is supported by an
enumeration of the symptoms that occur in the furvy,
and other highly putrid difeafes, which shew that the air
is actually detached from the blood in fuch cafes; as well
as from an examination of the principal and prevailing cafes
of fuch disorders. And since the air tainted with animal or
vegetable putrefaction is the fame with air rendered noxious
by animal respiration; since both equally extinguiih flame,
are equally noxious to animals, are equally and in the same way offensive to the smell, equally precipitate lime in lime water, and are restored by the same means, Dr. Priestley suggests; that one ufe of the lungs is to carry off the putrid effluvia, without which, perhaps, a living body might putrefy as foon as a dead one. See Blood and Respiration.

We fhall here observe, that putrefying and fermenting fubftances have been found, by the experiments of Mr. Cavendish, Dr. Priestley, &c. to yield not only fixed but inflammable air. From an experiment of Dr. Priestley, intended to determine the proportion of each of the kinds of air in the different fages of the putrefactive procefs, it appears that a piece of mutton weighing four penny-weights fix grains, yielded in all two measures of air, of which 3 was fixed, and the rest inflammable; and that all the inflammable part was exhausted a considerable time before the fixed air. The fame ingenious writer has observed, that the diminution of common air, by means of putrefaction, amounts to a complete fourth part of the whole, notwithstanding the production of fome permanent air from the putrefying fubftance, and has, in all refpects, the appearance of being produced solely by the precipitation of fixed air. It must occur to every reader, in any way acquainted with this fubjeft, if the philogical theory be admitted, (which indeed is now generally discarded,) that if inflammable air be the fame with phlogiferon, as Dr. Priestley feemed to have difcovered, many of the phenomena of putrefation, depending on this principle, fuch as the smell, colour, light, &c. will probably from hence admit of an easy explication.

We fhall here fubjoin fome observations with refpect to the decomposition of animal bodies that are interred in burying-grounds. In this situation, the decomposition is four times as foon as when the putrefying animal is expofed to the air. It is not perfectly ended, according to Mr. Petit, till three years after the body has been interred, at the depth of four feet; and it is flower in proportion as the body is buried at a greater depth. These facts agree with the principles which we have already eftablifhed for bodies buried in the earth, and subject to laws of decomposition very different from thofe which take place in bodies expofed to the air. In this cafe, the decomposition is fupported by the waters which filter through the earth, and diffolue and carry with them the animal juices. It is also favoured by the earth, which absorbs the juices with more or lefs facility. Meflrs. Lemery, Geoffroy, and Hunaud, have proved that argillaceous earths exert a very frow action upon bodies; but when the earths are porous and light, the bodies then dry very fpedifly. The feveral principles of bodies abforbed by the earth, or carried by the vapours, are difperfed through a great space, imbibed by the roots of vegetables, and gradually decomposed. This is what paffes in burying-grounds in the open air; but it is very far from being applicable to the fepulchres which are made in churches and covered places. Here is neither water nor vegetation; and consequently no caufe which can carry away, difsolve, or change the nature of the animal fluids: and we cannot but applaud the wisdom of government, which has prohibited the burying in churches; a practice which was once a fubjeft of horror and inflammation.

The accidents which have happened at the opening of graves and vaults are but too numerous, to render any apology neceffary for our fpreading a few words refpecting the method of preventing them.

The decomposition of a body in the bowels of the earth can never be dangerous, provided it be buried at a fufficient depth, and that the grave be not opened before its entire and complete decomposition. The depth of the grave ought to be fuch that the external air cannot penetrate it; that the juices, with which the earth is impregnated, may be conveyed to its surface; and that the exhalations, vapours, or gases, which are developed or formed by decomposition, should not be capable of forcing the earthy covering which detains them. The nature of the earth in which the grave is dug, influences all its effeets. If the ftratum which covers the body be argillaceous, the depth of the grave may be lefs, as this earth difficulty affords a paffage to gas and vapour; but in general it is admitted to be neceffary that bodies should be buried at the depth of five feet, to prevent all these unhappy accidents. It is likewife neceffary to attend to the circumftances, that a grave ought not to be opened before the complete decomposition of the body. This decomposition, according to Mr. Petit, is not perfect until the expiration of three years, in graves of four feet depth; or four years, when they are fix feet deep. This term affords many varieties, according to the nature of the earth, and the confitution of the subjects buried in it; but we may consider it as a medium. The pernicious custom, which allows a fingle grave to families more or lefs numerous, ought therefore to be fuppressed; for in this cafe, the fame grave may be opened before the time prefcribed. There are abfufes which ought to occupy the attention of government; and it is time that the vanity of individuals should be facrificed to the public safety. It is likewife neceffary to prohibit burying in vaults, and even in coffins. In the firft cafe, the principles of the bodies are fpread into the air, and infect it; in the fegond, their decomposition is flower and lefs perfect.

If thefe precautions be neglected; if the dead bodies be heaped together in too confined a place; if the earth be not proper to absorb the juices, and decompose them; if the grave be opened before the entire decomposition of the body;—unhappy accidents will no doubt be produced; and these accidents are but too common in great towns, where every wife precaution is neglected. An intance of this happened, when the ground of the church of St. Benoit at Paris was dug up a few years ago: a nauseous vapour was emitted, and several of the neighbours were affected by it. The earth which was taken out of this grave was unfavourable, vifcid, and emitted an infectious smell. Meflrs. Maret and Navier have left us feveral fimilar obfervations. Chaptal's Elem. of Chem. vol. iii.

Putrefation is one of the inflruments in nature by which many great changes are brought about. In the procefs of vegetable putrefation, if we throw together any of the tender, green, and succulent parts of recent vegetables, whether acid or alkaline, in a large heap, in the warm open air, and prefs them down with an additional weight, if their own be inconfiderable; the middle part of the heap will, in a little time, spontaneously conceive a small degree of heat, and pasa fucceffively through the other degrees, till it arrive at a state of obfubition, and be perfectly putrefied.

In the space of three days, from the firft putting them together, they will yield a heat, perceivable by the hand, equal to that of a human body in a healthy state; by the fifth, the heat will be too great for the hand to bear without pain; and, laftly, by the firft, seventh, or eighth day, the juices will generally appear ready to boil; and sometimes the matter will even flame, and burn away. By this spontaneous operation, the vegetable acquires an abominably putrid, fcorcoraceous, or cadaverous, tale and odour; and turns entirely into one foft, fimilar, pulpy mass, or craffamentum, greatly refembning feticl human excrements in the fcent, and putrefied flesh in the table.
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If now this putrid matter, thus obtained, be directly, whilst it remains in its putrid state, committed to a glass retort, and distilled with proper degrees of fire, there will come over, 1. A water impregnated with an urinous spirit, perfectly like that obtainable from animal subjects, and separable by a fresh distillation, made in a tall flask, into elementary water, and a large quantity of pure, white, volatile, dry, alkaline salt, not to be distinguished from animal fats. 2. A volatile, alkaline, oily salt, that reverts into globes. 3. An exceedingly volatile and thick putrid oil, both which are entirely like those of animals. And, lastly, the remainder, being calcined in an open fire, affords not the least particle of fixed salt; just as if the subject had really been of the animal, and not of the vegetable kingdom.

This process is truly universal, and holds equally in all kinds of vegetables, though ever so different in their nature and virtue.

Experiments have been made in the coldest and moist succulent, or watery, plants; such as purline, forrel, &c. as well as with the hottest and most climatious, such as the fpruges, &c. and it was always found to succeed; but that the foamer, as the vegetable employed contained the greater quantity of oil; though with the same phenomena.

It will likewise succeed with dry vegetables, provided they be moistened with water before they are thrown into heaps; and thus we sometimes see, that flacks of hay will spontaneously take fire, and burn away; especially if the hay was not well dried in the making.

The conditions necessary for the putrefaction of vegetables are similar to those required in the putrefaction of animal substances. It is necessary that the organization be impregnated with water; the contact of air is necessary, as is also a certain degree of heat; and for the due effect of this kind of decomposition, the vegetables should be heaped together, and their juices be abundant. In these circumstances, the phenomena of decomposition are as follow: the colour of the vegetable is changed; the green leaves become yellow, the texture becomes lax, and the parts less coherent; the colour of the vegetable itself changes to black or brown; the mafs rifes, and perceptibly swells up; the heat becomes more intense, and is perceived on approaching the heap; and the fumes which arise have already a smell, which sometimes is not disagreeable; at the lame time bubbles arise, and break at the surface of the liquid, when the vegetables are reduced to a magma. This gas is a mixture of nitrogen, hydren, and carbonic acid. At this epoch, likewise, an ammoniacal gas is emitted, which is formed in these circumstances: and, in proportion as these appearances diminish, the strong and offensive odour is succeeded by another which is fainter and milder, and the mafs becomes dry. The internal part still exhibits the vegetable structure, when the flem is solid, and the fibrous matter has been the predominating principle; and it then constitutes manure or soil. Hence it arises that the herbaceous plants of a loose texture, and abounding in juices, are not capable of forming manure by their decomposition, but are reduced into a brown mass of little confluence, in which neither fibre nor texture are observed; and this is what, for the most part, forms vegetable mould.

Vegetable mould usually constitutes the first covering or stratum of our globe; and in such cases wherein it is discovered at a depth in the earth, there is no doubt but it has been buried by some revolution.

When a vegetable is converted into earth by this tumultuous fermentation, it still retains the remains of the vegetable, mixed and confounded with the other solid earths and metallic products; and by distillation it affords oil, nitrogen gas, and often hydrogen. It may, therefore, be considered as an intermediate substance between crude and organic bodies, which participates of the inertia of the one, and the activity of the other; and which in this state is still subject to an insensible fermentation, that changes its nature still more, and deprives it of all its organic contents. These remains of vegetables, still contained in vegetable earth, serve as food for other plants that may grow in it. The insensible progress of fermentation, and the fucction of vegetables, impoverish the vegetable earth, deprive it of all its organic matter, and there remain only the earths and metallic residue which form the stiff poor soils, and occludes when the ferruginous principle is very abundant.

As this muddy earth is a mixture of all the primitive earths, and of the metals which are the product of vegetation, as well as the oils, the fats, and other products we meet with in it; we may consider it as the residuum of vegetable decomposition, as the deposit of mineral agents, and by which nature repairs the continual losses the mineral kingdom undergoes. In this mixture of all the general principles, the materials of all compounds exist; and these materials are so much the more disposed to enter into combinations, as they are in a more divided and distinguished state. It is in these earths that we find diamonds, quartz-crystals, fprars, gyptum, &c. It is in this matrix that the bog ores, or ochreous ores of iron, are formed; and it appears that nature has reserved the impoverished residue of vegetables for the reproduction or reparation of the earthly and metallic substances of the globe, while the organic remains are made to serve as nourishment for the growth of other succeeding vegetables.

Some have taken occasion to apply the process of putrefaction to that of digestion, or the change which the aliment suffers in the human body. (See Digestion.) For the change our vegetable foods undergo in the body, being such as brings them to be of the same nature, and to afford the same principles, with the change induced by putrefaction, is a presumption, that digestion is nothing else. Besides, as we know that neither animal nor vegetable substances can become aliment, without undergoing some degree of putrefaction, many distempers must proceed from a deficiency of this action; the crises of fevers seems to depend upon it; and even animal heat, according to Dr. Stevenfion, does the same.

Now, that the concoction of the humours is nothing else but putrefaction, seems probable from hence, that whenever they are in that state, they are always more fluid, and fitter to pass through the smaller vessels, where they stagnated before. Again, the offensiveness of the sweats, or other excretions consequent on a crisis, is likewise a sure sign of a high degree of corruption. The time of resolution or putrefaction depends on the degree of heat, the habit of the patient, and on the part obstructed. Resolution is the putrefaction of the impacted humour only, but fupputation implies a corruption of the vessels also. This manner of speaking, indeed, has been disputed, from the prejudice that nothing was putrid but what was offensively so; whereas, in fact, every fibre becoming more tender, and humour thinner, may be considered as putrid in some degree, whether the change tends to the better health, or to the destruction of the person, or whether it becomes grateful or offensive to the senses.

Mr. Boyle has used the words fermentation and putrefaction of the blood promiscuously, in his Treatise on the Human Blood. Stahl and other celebrated chemists likewise use the term putrid ferment; which see.
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It is, therefore, justly observed by Lord Bacon (Nat. Hist. cent. iv.) that an enquiry into the means of preventing or delaying putrefaction is of excellent use in phylec. Sir John Pringle has made many curious experiments with a view of determining the power of certain substances to promote or to prevent putrefaction, together with remarks on this subject, which are published in the Phil. Trans. vol. xlv. p. 480. 525. 550, and by way of appendix to his Observations on the Diseases of the Army. From the experiments of this learned and judicious physician, it appears, that fats of every kind, whether acid, alkaline, or neutral, fixed or volatile, as well as the astringent and gummy-refinous part of vegetables, all of them resist and most of them correct putrefaction; and he purified this branch of enquiry so far as to enable him to form a table shewing the comparative antiseptic power of the several substances, that of sea-felt being the standard. See this table under the article Antiseptic.

Of all re fins substances, he found that camphor resisted putrefaction most powerfully; its antiseptic power being three hundred times greater than that of sea-felt. Decoctions of wheat, barley, and other farinaceous grains, checked putrefaction, by becoming four. He also made experiments to discover the effects of mixing vegetable with animal matters.

Two drams of raw beef, as much bread, and an ounce of water, being heat to the confidence of paper and exposed to 90° of heat, according to Fahrenheit's thermometer, began to ferment in a few hours, and continued in a fermentation two days. When it began to ferment and swell, the putrefaction had begun; and in a few hours afterwards the smell was offensive. Next day the putrid smell ceased, and an acid taste and smell succeeded. Fresh alimentary vegetables, as spinach, asparagus, scurvy-grass, produced similar effects as bread on flesh, but in a weaker degree. From several other experiments, he found that animal substances excite the fermentation of vegetable substances; and that the latter substances correct the putrefaction of the former.

By adding saliva to a similar mixture of flesh, bread, and water, the fermentation was retarded, moderated, but rendered of twice the usual duration, and the acid produced at last was weaker than when no saliva was used.

By adding an oily substance to the common mixture of flesh, bread, and water, the fermentation was retarded, moderated, but rendered of twice the usual duration, and the acid produced at last was weaker than when no saliva was used.

Sugar was found to resist putrefaction at first, as other fats do, and also to check the putrefaction after it had begun by its own fermentative quality, like bread and other fermentative vegetables.

Lime-water made some small resistance to putrefaction.

Port-wine, small beer, infusions of bitter vegetables, of bark, and the juice of antiscorbutic plants, retarded the fermentation of mixtures of flesh and bread. But an untrained decoction of bark considerably increased that fermentation.

Lime-water neither retarded nor hallowed the fermentation of such a mixture; but when the fermentation ceased, the liquor was neither putrid nor acid, but smell agreeably.

Flesh pounded in a mortar was found to ferment more slowly than that which had not been bruised.

The tough inflammatory crust of blood was found to be more putrecessant, next to which the cafflamentum, or red congealed mass, and lastly the serum.

Charcoal is a powerful antiseptic; hence all sorts of glass vessels and other utensils may be purified from long retained smells of every kind, in the cafflament or most perfect manner, by rinsing them out well with charcoal powder, after the grosser impurities have been fowerd off with sand and potash. Rubbing the teeth and washing out the mouth with fine charcoal powder will render the teeth beautifully white, and the breath perfectly sweet, when an offensive breath has been owing to a fcorbatic disposition of the gums. (Cree's Journal, vol. ii.) Meat also, which is a little tainted with putridity, may at once be made sweet by charcoal, and it has been said, that common raw spirits agitated with charcoal will be deprived of their bad flavour, but they are apt to refine their old flavour, if kept in the dark only a few weeks.

The experiments of the author of the "Essai pour servir à l'Histoire de la Putrefaction," shew that metallic salts, reinosus powders, extracts of bark and opium, are very powerfully antiseptic, and that salts with earthy bases are less antiseptic than any other salts.

The same ingenious physician made some experiments towards the sweetening of corrupted flesh by means of mild substances. For this purpose he put a piece of putrid flesh into an infusion of chamomile flowers, which was renewed twice or thrice in as many days, and its sweetness and firm texture were recovered. Several pieces of putrid flesh were also sweetened by repeated infusions of a strong decoction of the bark; and he conflatly observed, that not only the corrupted smell was removed, but a firmness restored to the fibres. The corrupt yolk of an egg, diluted with water, was sweetened by mixing it with a strong infusion of chamomile flowers. He found also that decoctions of wormwood, of the bark, and infusions of chamomile flowers, and of snake-root, preferred yolks of eggs for a longer time than water, even with the addition of a considerable quantity of sea-felt; and that they were preferred better by salt of hartshorn than by four times the weight of sea salt. Ox-gall was kept for some time from putrefaction by small quantities of lea of tartar, spirit of hartshorn, crude ful ammonia, and the saline mixture; and still longer by a decoction of wormwood, infusion of chamomile flowers and of snake-root, and by solutions of myrrh, camphor, and salt of amber. The serum of human blood was preferred by a decoction of the bark, and an infusion of snake-root, as effectually as flesh. See Antiseptic.

For an account of Sir John Pringle's experiments and observations with respect to those subjects that haffen or promote putrefaction, see Septics.

Dr. Macbride's experiments confirm many of those above related, especially those which shew that the fermentation of vegetable substances is accelerated by a mixture of animal or putrescent matter, that the putrefaction of the latter is corrected by the fermentative quality of the former; and that the putrefaction and fermentation of mixtures of animal and vegetable substances were accelerated by additions of absorbent earths and of Peruvian bark. He also found, that although unburnt calcareous earths were septicks, quick-lime and lime-water prevented putrefaction, but that they did not destroy or dilute the texture of flesh.

From his experiments we learn also, that acids, even when strongly lowered, have a strong degree of power to resist putrefaction, and also to correct it; but that they destroy the texture of the substance whose soundness they were supposed to restore; that salts in general, by a property which is common to them all as salts, have the same power,
power, but that they exceed the acids in their efficacy for correcting putrefaction; that fermenting and effervescence mixtures are the most powerful of all known antiseptics; and, in general, that whatsoever hath a power to restrain the escape of the fixed air, or hinder the intellefire motion, must of course prevent putrefaction; and that fixed air, when transferred from a sound body to one that is putrid, appears to revolve to that body the principle which has been destroyed or lost.

Dr. Macbride objects against the adminiftration of acids in putrid difeases, for the following reafons; because, if they came unchanged to the aborbent vessels, they would not admit of them, and if they did, they would be dangerous, and they are quite changed before they leave the prime air. Dr. Crell (Phil. Trans. vol. ixi. part. i. p. 340.) has replied to this reafoning, and proposed experiments to prove, that acids, though changed in the alimentary canal to so fart as to effervece with alkalis, may, notwithstanding, check putrefaction, and, therefore, that their ufe is of great confequence, and ought not to be omitted in putrid difeases.

With regard to the exhibition of alkalis, Dr. Macbride obferves, that the point is not yet satisfactorily fettled. There can be no doubt of their power to refifit and correct putrefaction in dead bodies; but whether, upon the preufumption of this virtue, they can be given with propriety as antifeptics, he adds, is not fo clear. Dr. Crell affirms, that they can never be used in living bodies as antifeptics; for, laying aside their-flimming quality, which muff prevent their ufe in moff of the putrid difeases, they would, he apprehends, increafte the morbid matter, by being intimately mixed by circulation with phlogifitic matter, which they find abundantly in fuch bodiyes. Altrifying, says Dr. Macbride, prevent putrefaction very powerfully, but they have not the least degree of efficacy in correcting it; and as antifeptics, they can be of importance only in thofe cafes where, from extreme relaxation and resolution of the fluids, the difloved fluids are fuffered to tranfufe, and either form spots of different hues, or run of by actual hemorrhage; and he apprehends, that acfids act in thofe cafes where they have been administered withfficels, merely as altrifying. The antifeptic virtue of the gummy-refinous vegetables, judging of their effect by that of the bark, appears to depend on their fermenting in the body, and partaking with fixed air in the courfe of their fermentation, and throwing a great quantity of it into the blood; and attending to the things that prevent putrefaction in living bodies, we fhall find that the dependence is on the quantity of air. Thus, vegetable food prevents the putrefactive diathesis; and to the frequent ufe of fresh vegetables and fugar, in the diet of the European nations, it is owing that putrid difeases or plagues are now no uncommon. And what proves almost to a demonstration the antifeptic power of the fermentable fubftances, is the cure of the lea-fcurry.

Dr. Crell digs agreements with the opinion of Dr. Macbride, that putrid difeases may be cured with fermentable fubftances only; nor is he convinced that putrefaction depends only on the loss of fixed air. Thus, he apprehends, is an effect rather than the caufe of putrefaction. We fhall here only add, that Dr. Macbride recommends, in the putrid yellow fever of the Weft Indies, to give the patient repeated doses of the alkaline farts, in fresh lime-juice, or the like, and to let it be swallowed during the effervence; and to order the patient's drink to be somewhat of the highly fermentable kind; such as the juice of the green fugar-cane, diluted and acidulated with fome of the recent four juices. The natives on the coaft of Africa give in fvers of this kind, with gooduccels, a drink prepared by macerating in water a fruit of the plum kind, that grows there in great plenty. He adds, that by throwing in fuch a quantity of antifeptic vapour as would be furnished from this kind of materials, the putrefactive acrimony, which at first seems chiefly to affect the bilary fystem, might be corrected and faturated. See on the subje6t of this article Dr. Macbride's Essays, 1776, pages 335, 336.

**Putrefaction.** in *Physiology*, the spontaneous changes which animal substances undergo, when deprived of life. See Death.

**Putrefaction**, in *Agriculture*. It is by means of putrefaction, as flated under its appropriate article, that various substances and bodies are decomposed, reduced, and brought into the state proper for being applied to lands for the support of crops; but this is more fully explained, in speaking of the nature of the different materials that are capable of being made ufe of in ameliorating land for the growth of crops. See Manure.

**Putrefaction of Water.** It is said to be the peculiar quality of the Thames water, that it will flink and yet be wholesome; and after this will recover itself again. Many sailors have been obliged to drink it flinking, to that they held their noses while they poured it down their throats, yet no ficknefs ensued from it. It generates a fpirit alfo in this flinking flate, which will take fire at the approa6h of a lighted candle, as if spirit of wine were touched by the fame.

It appears from the article *Putrefaction*, that though a volatile alkali may be obtained from putrid fubftances by difflation, fuch fubftances muff not be suffered to remain too long before they are diffilted, unlefs they are kept in clofe vessels; because the volatile alkali, which is the offspring of putrefaction, is difsipated as falt as it is generated, inomuch that, at length, nothing is left behind but an infipid water, or a solid matter, being an earth fimilar to common mould. It is in this way, fays Dr. Macbride, that flinking water, after fome time, becomes fweet: the volatile alkali, generated by the putrefaction of the animal and vegetable fubftances at first contained in the water, being, after a while, entirely difsipated, leaves the remainder without any difagreeable fmal.

Putrid water is immediately deprived of its offensive fmal by charcoal. If putrid water be agitated with a small quantity of magnesia, it will lose its bad taste and fmal in a few minutes. See Crell's Journal, and Prouf, Journal de Physique.

A method of preferving water free from putrefaction was fome years fince proposed by Dr. Alton. It confifted in adding a quantity of lime to every caflk of water; and as lime is known to have a strong antifeptic property, water, as long as it retains the impregnation of lime, never putrefies. In order to free the water, at the time of using it, from the lime, Dr. Alton proposes the precipitation of the latter by throwing a quantity of magnesia alba, on this principle, that as lime-stone is rendered foluble in water by the deprivation of its fixed air, and has a greater affinity with that air than magnesia has, the particles of quicklime difflated in the water would attract the air from the magnesia, and thereby becoming no longer soluble, would fall to the bottom, and leave the water tasteless and fit for economical ufe. See Lime-water and Magnesia.

The expence, however, attending this procefs prevented the execution of the propofal. Mr. Henry has not long ago suggefted a cheap and eafily practicable method of precipitating the lime, and thus of reftoring the water to its original taste. The following is a short fketch of the author's procels. To
preferre the water from putrefaction, two pounds of good quicklime are directed to be added to each cask of water of a hundred and twenty gallons. To free the water afterwards from the lime with which it has been impregnated, it is to be drawn off into a strong cask, containing about sixty gallons, with an aperture at one end large enough to admit a vellum, which is to be let down into it by means of string, and which contains a proper quantity of effervescence materials, that is, of marble or chalk, and vitriolic acid. Eight ounces of mild calcareous earth, and fix ounces of strong vitriolic acid, will be sufficient for sixty gallons of lime-water. The mouth of this last vellum is to be flopped with a tubulated stopper, through which the fixed air, let loose from the marble, paffes up through the body of the water. The lime is thus rendered insipid, and is soon precipitated in the form of an impalpable powder of chalk; the water being thus reflored to the same state of purity as when it was first shipped on board; or, as Mr. Henry believes, to a state of still greater purity; several hard waters having, in consequence of this process, been rendered as soft as rain water, and freed from different impregnation. For farther particulars, and the description and drawing of an apparatus for this operation, see Henry's Account of a Method of preserving Water at Sea, &c. p. 10, &c. 1781.

PUTRESCENT MATTERS, in Agriculture, such subflances as are in a state of putridity. Various materials of this kind are capable of being made use of by the farmer. It has been lately suggested by Dr. Hunter, of York, in a paper in the third volume of the Farmer's Magazine, that different materials of this nature may form a substitute for the folding of sheep.

The trouble and expense of keeping a flock of sheep for the purpose of folding, may probably be avoided by forming large ponds, so constructed as to receive and hold water. Into these ponds let drains from the stables, cow-houses, ox-halls, pigeon and wash-houses be directed; and, in order to enrich the water, let all kinds of vegetable and animal subflances be thrown in, particularly the contents of the necessaries and slaughter-house. It is presumed, that this putrid water, when put upon the land by means of water-carts, will prove as beneficial as a flock of sheep kept for the express purpose of folding; and where no sheep are kept for that purpose, such will prove an excellent manure for meadow land. A pond of sixty feet diameter, by six feet deep, which will contain upwards of 7000000 gallons of water and putrefective bodies, may be equal in its effects to a considerable fold of sheep. The putreficiency of the water may be greatly increased, by occasionally supplying the ponds with the refuse of fish, and sea-weed, where they can be conveniently procured; and in all places within a reasonable distance of sea-parts, where ships are employed in the Greenland fisheries, the farmer will find a seasonable supply of putrefactive matter by the purchase of the whale blubber, after the oil has been taken from it. Such is the strength of the last named subflance, that it is well worth the farmer's while to be at the expense of carrying it in casks to a considerable distance, for the purpose of giving vigour to his compost dunghills. The ancients were fru♥ulously nice in the formation of their dunghills; and it is a reproach to the present race of farmers, that to material a branch of their business should, at this day, be in imperfectly known or attended to. And in many large cities, and especially Edinburgh, it would be a great improvement, if a well-constructed resevoir was made to receive the excrementitious matter, the slough being occasionally replenished with earth and small rubbish. In this manner, many thousands of loads of rich manure might be saved from the sea, to which place the excrementitious matters are upon their passage.

PUTRID, PUTRIDES, something rotten, or putrefied. See Putrefaction.

Thus we say, putrid flesh; a putrid humour; putrid limbs, i.e. mortified ones, are to be cut off.

PUTRID DISSECT. See Putrid Fever, &c.

PUTRID FERMENT. See Ferment.

PUTRID FEVER, &c. in Medicine, an epithet originating in the chemical school of physis, in which the true operations and phenomena of life were mistaken for the fermentations and decompositions of the laboratory. This mistake was probably the refult of the offensive smell, and actual putrefactive odour of some of the discharges from the living body, in the last stages of severe fevers; but farther observation has demonstrated that, however the excrescences may undergo the processes of putrefaction after they are thrown out of the living body, no degree of putrefaction can exist for a moment in the circulating blood, without occasioning infant death.

The symptoms which were formerly ascribed to putrefaction, but which are now believed to originate from a great deficiency of the vital or nervous power derived from the brain and nervous system, are such as occur in typhus gravior, the hospital and gaol fever, and in the worst cases of dysentery, and small-pox; among which are a black tongue and mouth, extreme proliteration of strength, fetid evacuations from the stomach, bowels, and bladder, haemorrhages, petechiae, and purple blotches, &c. See Fever, and Typhus.

PUTRID Ulcer. See Ulcer.

PUTRINE, in Geography, a town of Prussia, in Oberland; six miles W. of Paffenhein.

PUTT, in Rural Economy, a provincial word, applied commonly in some districts to the mole-hill. Alto, sometimes to animals which put or thrust with their horns.

PUTT, or Pine, in Geography, a town of Anterior Pomerania; eight miles S.W. of Stralland.

PUTTAN-SUMNAUT, a town of Hindoostan, in Guzerat; near which was a famous pagoda, much venerated and frequented by devotees from all parts of the country. In the year 1602 this town and temple were taken by Mahommed, king of Ghizani, and plundered of their great wealth. In the temple was found a statue, in which, on being broken, was found a vast quantity of precious stones. The Hindoos believed that the souls of deceased persons came to this place to be transferred to other bodies; 80 miles S. of No~magur. N. lat. 21° 1'. E. long. 69° 40'.

PUTTEN, VANDER, HENRY, in Biography, was born at Vandloo in 1574; after studying at the universities of the Low Countries, he visited Italy; and for a considerable time was professor of rhetoric at Milan, where he took the degree of doctor of laws. He was nominated historiographer to his Catholic majesty, and received the honour of citizenship at Rome. In 1656 he was invited to the chair of Lipius, who had been his tutor. He was also made a counsellor to the archduke Albert, and entrusted with the government of the citadel of Louvain. When a truce was negociating between the Dutch and the king of Spain, in 1633, he published a work, entitled "Statuta Beli et Pacis," in which he shewed how important a peace would be to the Spanish Netherlands. This work gave great offence, and the author had nearly experienced the usual fate of those who counsel pacific measures, at a time when passion, prejudice, and interest, urge the continuance of war. He died at Louvain in 1646, age 72. Besides his "Statuta," mentioned above, he published "Historia Infurbia;" "Orchelira
"Orchestra Burgundica;" "Theatrum Historicum Imperatorum:" "Comus, feu de Luxu;" "De usu Bibliothecarum," with a catalogue of the Ambrosian library; besides several tracts relative to classical antiquities, printed among the collections of Graevius and Gronovius. Moreri.

Bayle.

PUTTEN, in Geography, a small island of Holland, in the Meufe, E. of Voorn.

PUTTERAHEN, a town of Hindooftan, in the cirear of Gohud; 27 miles E.E. of Gohud.

PUTTOCKS, or Putock-Srounds, otherwise called futlock or foot-book srounds, in a Ship, are small srounds which go from the srounds of the main-mast, fore-mast, and mizen-mast, to the top-mast srounds; and if there be any top-gallant mast, there are puttocks to go from the top-mast srounds into these. These puttocks are at the bottom fixed to a flaff, or to some rope which is fixed to a plate of iron, or to a dead-man's eye, to which the laniards of the foremast srounds come. See Srounds.

PUTTY sometimes denotes a white powder of lead and tin calcined together, in the proportion of two parts of lead to one of tin; used in polishing, and giving the last gloss to works of iron, steel, Rone, and glas. This is also the basis of white enamels, and glazings for earthen-ware.

PUTTY is also used to denote epidium.

PUTTY, in its popular sense, denotes a kind of paste, compounded of whiting, with or without a little white lead, and linseed oil, beaten together to the consistence of a tough dough; used by glaziers for softening the surfaces of glasses in sround-windows, &c. and by painters, to float up the crevices and clefts in timber and wainscot, to prevent the wet from getting in, and ruining the work.

PUTTIRAM, in Geography, a town of Hindooftan, in Bengal; 18 miles E.S.E. of Dioneapour.

PUTUAY, a small island on the coast of Bengal. N. lat. 22° 41'. E. long. 89° 28'.

PUTUMAYO, a river of South America, which rises about 80 miles S. of Popayan, pursues an eastern course, inclining to the south, about 300 miles, and after being joined by a branch of the Caquet, takes the name of Ica, and running S.E. about 200 miles, joins the river of the Amazons in S. lat. 3° 30'. W. long. 50° 40'.—Also, a town of South America, in the government of Popayan, on a river of the same name; 50 miles E. of Paifu.

PUTURA, a crom claimed by the keepers of forests, and sometimes by bailiffs of hundreds, to take man's meat, horfe's meat, and dog's meat, of the tenants and inhabitants, gratis, within the perambulation of the forest, hundred, &c.

"Johannes claunum unam putaram in prioratu de Pegovfham, qui eft quaedam cella abbatis de Eyevham, pro fe & miniftris, equis, & gbaronibus libus, per unum diem & duas noctes, de tribus femina, in tres femina, vic. de viciafulibus, ut & elenchis & potulentis, ad coltas prioratus predicati indebito." Placit. apud Pratton. 17 Edw. III.

This crom, within the liberty of Knaurebarg, was long since turned into the payment of four-pence, pro putra.

The land subject to this service is called terra puturata. The learned Sonner has erred in his exposition of this word.

PUTYAJURY, in Geography, a town of Bengal; 30 miles S.S.W. of Silhet.

PUTZIG. See PAUZK.

PUSIGLIO, a town of the duchy of Parma; nine miles N.E. of Parma.

PUWAKHAGA, in Botany, the name by which some authors call the faufel-tree, of whose fruit the exprefted juice called terra Japonica, or Japan earth, is made.

PUXUANAIRIO, in Geography, a town of Mexico, in the province of Mechoacan; 25 miles N.W. of Mechoacan.

PUY, Peter du, in Biography, the third fon of Claude du Puy, a magistrate in the parliament of Paris, was born in that city in 1582, and was educated with great care under his father. While a youth, he made extraordinary proficiency in literature, and full further improved himself by a journey to Holland, whither he accompanied the French ambassador. After his return he laboured with great industry incerte, in ascertaining the rights of the crown of France over some of the neighbouring districts, and for that purpose indefatigably in his examination of ancient charters, and thereby acquired a profound knowledge of French history. The reward of this, and other labours of the same fort, were the places of king's counsellor, and keeper of the royal library, in both of which he was distinguished by his patriotism and love of letters. His works were numerous and valuable. In almost all of them he aims at reproducing the ecclesiastical authority, and the claims of the see of Rome; hence they were not well received at the papal court. They are, however, said to contain a rich treasure of facts relative to all the matters on which he treats. He died at Paris in 1651, at the age of 69, and his life was written by his intimate friend Nicholas Rigault. Some of his writings are as follows: "Preuves des Libertés de l'Eglise Gallicane," "Histoire Veritable de la Condemnation de l'Ordre des Templiers," "Traité de la Loi Salique," "Du Concordat de Bologne entre le Pape Léon X., et le Roi François I;" "Apologie de l'Histoire de M. le Prince de Thou." He had a brother, James, prior of St. Sauveur, who became keeper of the king's library after the death of Peter, whom he assisted in all his works, of the greater part of which he was the publifer. He died in 1656, leaving behind him a high character for learning and probity. Another brother, Christophe du Puy, was prothonotary to the cardinal de Joyeuse, and by his reminiscences he prevented the congregation of the Index from putting the first of De Thou's history in the list of heretical books. He was king's almoner, and, while attached to cardinal du Perron, he made a collection entitled "Perroniana." He became a Carthusian, and died at Rome in 1554, proctor-general of his order.

PUY, Louis du, a man of letters, was born at Clarey, in Bugey, in 1709; he studied in the college of Lyons, and came to Paris in 1732. He was for a considerable time principal editor of the Journal des Scavous, and during thirty years enriched this collection with a great number of critical dfferences. He was well versed in the learned languages, and in the mathematics, and acquired an extensive knowledge of history and antiquities. The prince of Souhille entrusted him with the management of his library, and by his care it was rendered one of the most valuable in the metropolis. In 1753 he was nominated secretary to the Academy of Inscriptions, in which situation he pronounced the eulogies of twelve of his associates, and edited from the 36th to the 41st vols. of its memoirs. He died in 1795. He was author of "Observations on infinitely small Quantities, and the metaphysical Principles of Geometry," inserted in the Journal des Scavous for 1759; "A Translation of four Tragedies of Sophocles," 1762; "A Translation of the Greek Fragments of Anthemius on mechanical Paradoxes, with Notes," from memoirs on the Roman coin, the silver denier of Charlemagne, and other antiquarian and literary subjects. Du Puy was highly eflenced for strict probity,
PUY

fincerity, and an obliging disposition, which displayed itself in useful advice and information to those who consulted him on literary topics.

PUY, Mademoiselle du, a celebrated performer on the harp, who had acquired a considerable fortune by the exercise of her talents in different parts of Europe. She died at Paris in 1777, and made a will that seem'd dictated by infamy. Among other articles, the ordered that no blind, lame, or deformed person should attend her funeral. She ordered that her house should be let to none but nobility. She left a large piece of ground to be formed into a public garden, upon condition that no flunted trees should be allowed a place in it. And lastly, she bequeathed an annuity for the maintenance of cats, of which she was fond, and for a perfon to take care of them. But the annuity depended wholly on the life of the cats. The harp upon which she had acquired her possessions, was left to a blind harper in the Hopital des Quinze Vingts, who played tolerably well on many different instruments. Great pains were taken to fet this will aside, but without effect. It was declared valid by law, and obliged to be executed. Laborde.

PUY, Le, in Geography, a town of France, and principal place of a district, in the department of the Upper Loire, and capital of the department, situated on a small river near the Loire; before the revolution, the fee of a bishop; a place of considerable trade, especially in lace; 38 miles S.W. of Lyons. The place contains 15,915 inhabitants, in two cantons, the one containing 13,106, and the other 1,810, on an extent of 185 kilometres, in 16 communes.

N. lat. 45° 21'. E. long. 3° 57'.

PUY-Laurent, a town of France, in the department of the Tarn, and chief place of a canton, in the district of Lavaur; 12 miles S.E. of Lavaur. This place contains 6548, and the canton 9817 inhabitants, on a territory of 125 kilometres, in 9 communes.

PUY-d'Evêque, a town of France, in the department of the Lot, and chief place of a canton, in the district of Cahors; 14 miles W. of Cahors. The place contains 2082, and the canton 12,127 inhabitants, on a territory of 285 kilometres, in 11 communes.

PUY-Mirab, a town of France, in the department of the Lot and Garonne, and chief place of a canton, in the district of Agen. The place contains 1265, and the canton 8072 inhabitants, on a territory of 125 kilometres, in 11 communes.

PUY-de-Bellard, a town of France, in the department of La Vendée; 18 miles N.W. of Fontenay-le-Comte.

PUY-Caillou, a town of France, in the department of the Gers; nine miles N.E. of Auch.

PUY-de-Dôme, a mountain of France, near Clermont en Ferrand, 810 toises in height.

PUY-de-Dôme is also the name of one of the nine departments of the central region of France, so called from the mountain that is situated in it; it is bounded on the N. by the department of the Allier, on the E. by that of the Rhône and Loire, on the S. by the departments of the Cantal and Upper Loire, and on the W. by those of the Correze and Creuse; formerly Lower Auvergne, in N. lat. 45° 40', containing 8450 kilometres, or about 35 French leagues in length, and 22 in breadth, or 447 square leagues, and 508,444 inhabitants; divided into five districts, viz. Riom, including 126,640; Thiers, 61,530; Ambert, 75,535; Clermont, 158,440; and Issoire, 88,290 inhabitants; 50 cantons, and 438 communes. The circles, according to Haffenratz, are 8, the cantons 71, and the population 516,593. Its capital is Clermont. The general total of its contributions in the 11th year of the new French era, was estimated at 3,656,547 francs; and its expenses for administration, judiciary, and for public instruction, at 37,468 francs, 37 cents. The soil of this department, diversified with hills and plains, is remarkably fertile, producing abundantly grain, wine, fruits, hemp, and pastures. It has mines of silver and lead, mineral springs, &c.

PUY le Garde, a town of France, in the department of the Lot; 15 miles N.E. of Montauban.

PUY Guillaume, a town of France, in the department of the Puy de Dome; eight miles N.E. of Lezoux.

PUY Laurens, a town of France, in the department of the Aude; seven miles S.E. of Quillan.

PUY Martin, a town of France, in the department of the Upper Garonne; 17 miles N. of St. Gaudens.

PUY Midian, a town of France, in the department of the Lot and Garonne; six miles E. of Marmande.

PUY Molleron, a town of France, in the department of the Lower Alps; 15 miles S. of Digne.

PUY Notre Dame, or Puy en Velay, a town of France, in the department of the Aveyron and Loire; 10 miles S.W. of Saumur.

PUY de la Pois, a town of France, in the department of the Puy de Dome; 18 miles E. of Clermont.

PUY la Reque, a town of France, in the department of the Lot; 17 miles N.E. of Montauban.

PUY St. Martin, a town of France, in the department of the Drôme; 11 miles N.E. of Montelimar.

PUY Val d'Or, a town of France, in the department of the Eastern Pyrenees; 10 miles N.W. of Montlouis.

PUYA, in Botany, the vulgar name, in Chili, of a plant, which is figured in Feuillee, v. 3. 59. t. 39, and adopted as a genus, after Molina, in Juffieu's Genera 447, under the above barbarous appellation, with the following character. "Calyx in fix deep segments; the three innermost largest, and vaulted. Stamens six, inserted into the lower part of the calyx; their filaments formed like a scale at the base, and bearing honey. Germen superior, triangular; (style and stigma unknown). Capsule of three cells, with numerous minute seeds, (doubtful whether furnished with down.)"

Feuillée's description is to the following effect. The roots are fibrous, throwing up several items, about nine feet high, as thick as a man's body at the bottom, where they are clothed with the scaly imbricated vestiges of old leaves, above which stand the numerous leaves of the present year. These are three or four feet long, and about two inches wide, refembling the foliage of the Pine-apple; their margins being fringed with very sharp hooked prickles, five lines long, and about an inch and a half asunder; the surface of the leaves is smooth, shining, of a fine bright green. The Indians make use of these prickles as fish-hooks. The part of the stem above the leaves is round, two inches or more in thickness; of a bluish-green externally; white and watery within, clothed with very thin, alternate, clasping leaves, or scales. The summit confines of a large pyramidal of flowering branches, or spikes, the lowermost a foot long; all clothed with similar scales, or bracteas, each of which is accompanied by a feathery axillary flower. Each flower is composed of six leaves, three large and three small, in a double row. The latter are three quarters of an inch long, (Feuillee 5 1/2, apparently by mistake, three inches,) and three lines and a half broad, covered with minute white down: the three larger are of a greenish-yellow, two inches and a half long, and nine lines broad, terminating like a Gothic arcade. The flowers roll up spirally as they fade. Six flaments spring from the bottom of each flower, surrounring a triangular pistil, which extends beyond them, and becomes a fruit.
PWL

a fruit of three cells, filled with an infinite number of seeds. Feuillet met with several specimens of this plant in the kingdom of Chili. He refers it to his genus of *Renelia*, the *Tillandsia* of Linnaeus. Jussieu justly suspected its being the same genus with *L'Heritier's Pitcairnia*, see that article; of which therefore the plant in question may be presumed to constitute an additional species to the four we have described; agreeing most with *P. brasiliensis* in habit, size and colour, but differing in having more spiny leaves, as well as a more compound inflorescence.

The reader will observe that Jussieu, according to the principles he has assumed, calls the whole integument of the flower a calyx, while we follow other writers in taking the three inner parts for petals; a measure justified, if we mistake not, by their habit, and mode of withering. The little differences respecting the scales or nectaries may easily be reconciled.

PUYCERDA, in Geography, a town of Spain, in Catalonia, and capital of the county of Cerdagne, surrounded with walls and battlements, and defended by a castle; 19 miles E.N.E. of Urgellus. N. lat. 42° 39'. E. long. 1° 49'.

PUYX or PUYX, a town of France, in the department of the Landes; nine miles S.W. of Aire.

PUYS, a term used for the poles with which the keels on the Tyne river are rowed along.

PUYSEGUR, James de Chastenet, Lord of, in Biography, lieutenant-general under Lewis XIII. and XIV., was born in 1600. He entered the army at the age of seventeen, and served, without intermission, during forty-three years. He was present at about thirty battles, and one hundred and twenty sieges, without ever having been sick or received a wound, but he had not the good fortune to rise in his profession, being more zealous for the king's service, than complaisant to the ministers. He drew up "Memoirs," comprising the period from 1617 to 1658, in which are contained various remarkable particulars relative to the campaigns in which he served, with useful military instructions. They were printed at Paris and Amsterdam in 1690, 2 vols. 12mo. under the inspection of Du Chevne, hitorigrapher of France, and they have the character of narrating with freedom and fidelity. He died at his country seat in 1682. Moreri.

Puysegur, James de Chatelet, Marquis de, was son of the preceding, born at Paris in 1655, and entered into the army under his father, and gradually rose to the post of commander-in-chief in the French-Netherlands, and finally, to the still more important one of a marshal of France in 1734. He died at Paris in the year 1743, at the age of 88. He was author of a work "On the Art-Military," published by his only son the marquis of Puysegur. Moreri.

PUZZALO, in Geography, a town of the island of Sicily, in the valley of Noto, near the S. coast of the island; 12 miles S.W. of Noto.

PUZZLING BAY, a bay in the fruistrates of Magellan, on the coast of Patagonia. N. lat. 53° 35'. W. long. 74° 28'.

PUZZOLANA. See Pozzolana, and Calcareous Cement.

PUZZUOLI, in Geography. See Pozzolana.

PwLHeLi, a borough, market, and sea-port town in the parish of Denio, county of Cambogia, cantref of Lleyn, now called the hundred of Glyflogion, county of Caernarvon, South Wales, is situated on the South side of the promontory of Lleyn, in St. George's Channel, at the distance of 27 miles S.S.W. from Caernarvon, and 241/4 miles W.N.W. from London. This town consists chiefly of aingle street, parallel to the shore. It was constituted a free borough by Edward the Black Prince, at the request of Nigel de Lohareyn, and had its privileges confirmed by king Edward III. The government is vested in a mayor, recorder, and two bailiffs, who have the powers of justices. The market days here are Wednesday and Saturday, weekly; and there are besides six annual fairs. This port has a considerable trade; and upwards of eighty ships, of different burthen, belong to it. Along the coast to Bardsea inland, an extensive and valuable herring fishery has been lately established. The harbour is good, and well sheltered from the winds; and the bay, to which the town gives name, affords excellent anchorage ground. PwLHeLi is one of the contributory boroughs with Caernarvon, in returning one member to parliament, and is likewise the seat of the petty sittings for the district of Lleyn, which extends about twenty-two miles in length, and from three to ten in breadth, projecting into the sea in a manner similar to the county of Cornwall. According to the parliamentary returns of 1811, the parish contains 312 houses, and 1383 inhabitants, of which number, above one-half are resident in the town of PwLHeLi.

At the distance of five miles from this town is Carn-Madryn, a strong fortress, which formerly belonged to the sons of Owen Gwynedd. The bottom, flat, and top are filled with cells, varying in size and shape, many of which are still nearly entire. Close to the sea-coast is an entrenched, called Dinah Dinlle, which constitutes an object of great attraction from the road to Caernarvon by Clynnog, a neat romantic village, boating one of the largest and handsomest churches in Wales. Near it is the valley called Nant-y-Gwthrewir, or the valley of Vortigern, where that prince is said to have concealed himself, to avoid the persecution of his subjects. It is bounded on two sides by rocky slopes, only productive of heath and flinted gravel, and on the third by a tremendous precipice. The only opening to this seclude spot is towards the sea, "a northern aspet, where chilling winds exert all their fury, and half freeze, during winter, its few inhabitants." Nichollson's Cambrian Traveller's Guide, 1813. Carlile's Topographical Dictionary of Wales, 1811, 4to.

PYANEPSIA, *Piano*, in Antiquity, a feast celebrated by the Athenians in the month Pyanepsis; which, according to the generality of the critics, corresponded to our September.

Plutarch refers the institution of this feast to Theorus; who, at his arrival from Crete, made a kind of sacrifice to Apollo of all the provisions remaining in his vellum; putting them all into a kettle, boiling them together, and eating them with his six companions; which custom was afterwards continued. The scholium of Aristophanes says, this was done to acquit himself of a vow he made to Apollo in a temple.

M. Baudelot writes the word *Panoepis*, and takes it to be a feast instituted in memory of Theorus's return after killing the Minotaur.

The Greeks vary as to the origin and signification of the word Pyanepsis, whence the feast is denominated. Harpocrates calls it *Panoepos*; he adds, that others call it *Panoepis*, because then the fruits all appear to the eye. Herodotus writes *Panoepis*; and derives it from *Panoepis*, *beau*, and *fagi*, *comps*, because in this feast the Athenians gathered their beans, and made a kind of broth of them.

PYANEPSION, 12 March, in the Athenian Chronology, a month of thirty days, in which the festival Pyanepsis was celebrated, and called by the Bactians Damatrius.

PYAPOUR, in Geography, a town of Hindooftan, in Bahar; 13 miles E. of Bahar.

PYEO.
PYBOLOWO, a town of Lithuania; 25 miles E. of Mink.

PYCnanTHEMum, a name contrived by Michaux, from πυκνός, denso, and αἷμα, a flower, to express the dense inflorescence.—Michaux Boreali-Amer. v. 2. 7. Ait. Hort. Kew. v. 3. 376. Puri. v. 2. 409. (Brachytylum; Michaux Boreali-Amer. v. 2. 5.)—Class and order, Didynamia Gymnofpermia. Nat. Ord. Verticillate, Linn. Labiatae, Jüf.  

Gen. Ch. Cal. Perianth of one leaf, inferior, tubular, frayed, erect, permanent, with five awl-shaped, acute, nearly equal teeth; the mouth naked. Cor. of one petal, ringent; tube cylindrical, the length of the calyx; upper lip nearly erect, oblong, slightly convex, rounded, scarcely notched; lower lip much the largest, widely spreading, channelled, three-lobed; the lateral lobes semi-elliptical; the middle one longest. Stam. Filaments four, awl-shaped, dilated, various in length; two of them shorter than the act; anthers with two parallel cells. Pel. Germen superior, four-cleft; style bristle-flapped, rather shorter than the corolla; stigma two, spreading, acute. Perc. none, except the permanent calyx. Seeds four, roundish.  

Eff. Ch. Calyx five-cleft. Middle segment of the lower lip of the corolla longer than the rest. Stamens diant. Anthers with parallel cells.  

Obs. This genus seems to differ from Satureja principally in the form of its corolla. The species, as far as we know, are all American.  


—Found in old fields and copses, from Virginia to Carolina; flowering from July to October. It was cultivated in Shepard's garden at Eltham before the year 1732, but has scarcely been attended to by recent amateurs. The root is perennial. Stem three feet high, erect, somewhat branched, leafy, bluntly quadrangular. Leaves about two inches long, on short stalks; their under side mottled hoary or downy. Flowers white, tinged with red, in dense ferralled hoary whorls, with a terminal head; their inner bracteas bristle-flapped. The whole herb is clothed with fine softly pubescent, the leaves marked with pellucid dots; their scent aromatic, partaking of the common, as well as sweet, Marjoram.  

2. P. arifatum. Brilfy Tufted Savory. Michaux v. 2. 8. t. 33. Puri. n. 2. Ait. n. 2. (Nepeta virgina; Linn. Sp. Pl. 870. Willd. Sp. Pl. v. 3. 56. Chinopodium amarum folio, flore albo; Pluk. Phys. t. 85. f. 2.)—Leaves ovato-lanceolate, somewhat hoary, slightly ferrated. Heads seffile. Bracteas and calyx awned.—Native of dry woods, on a limestone soil, from Maryland to Carolina, flowering in July and August. Miller appears to have cultivated this species in 1752. It is perennial, with altogether the herbage and aspect of Origanum. The leaves are not an inch long, nearly seffile, dotted, veiny, thick-edged, very minutely, and scarcely perceptibly, hoary. Flowers white, small, in numerous, dense, terminal, hoary, compound heads. Bracteas lanceolate, entire, with long, rigid, awn-like points.  


—Native of high mountains in Carolina, according to Michaux, the only person who appears to have gathered this plant. The stem, and part of the rest of the herb, are usually tinged with purple. We have seen neither specimen nor figure.  


—Found on the mountains of Virginia and Carolina, but as yet a stranger to our gardens. It flowers from June to August, and is perennial. The habit of the plant, and its coloured bracteas, resemble Monarda filiformis. The flowers are small, and pale red, according to Mr. Pursh, on whom we depend for the synonymy of Walter.  


—Found in rather dry and mountainous meadows of North America, from New England to Carolina, flowering in July and August. Miller had it in cultivation in the year 1739, and it is still preferred in curious gardens, being a tolerably hardy, somewhat shrubby, perennial, of a bushy corybose habit, about eighteen inches or two feet high. The whole plant smells strongly of Penny-royal. The stem is square, pale, downy chiefly at the angles; its upper branches rising all nearly to a level, and forming a corynbous of numerous, globose or hemispherical, downy heads, of small white flowers. The bracteas are numerous, all ovate; the outer ones large, the inner very downy. Such is the plant intended by Linneaus under the above synonym, and which is perhaps rather the P. lanceolatum of Pursh, than his linifolium. In the latter the flamines are longer than the corolla; in the former they are shorter; but this is evidently, as in Mints, a variable circumstance; and therefore the Pycanthemum and Brachylylum of Michaux, are certainly one and the fame genus. We are confident also that there is no specific difference between Pursh's and Willdenow's linifolium and lanceolatum.  

Sect. 2. Stemens within the tube. Brachylylum of Michaux.  

6. P. muticum. Pointed Tufted Savory. Puri. n. 7. (Brachylylum muticum; Michaux v. 2. 6. t. 32.)—Leaves ovate, pointed, smooth, somewhat ferrated, Heads terminal, fleshy, solitary. Bracteas lanceolate, acute, awn-leaved.—Gathered by Michaux in Upper Carolina. Mr. Pursh never found this species. The former writer is incorrect in his definition of the leaves, which are by no means ‘‘ lanceolate-oval,’’ nor are they ‘‘ dentate,’’ but truly ferrated, at least in his plate. The heads bear some resemblance to those of our fifth species, but are less globose.  

7. P. verticillatum. Whorled Tufted Savory. Puri. n. 8. (Brachylylum verticillatum; Michaux v. 2. 6. t. 31. Origanum clinopodioides; Walt. Carol. 165.)—Leaves ovate, pointed, entire. Flowers capitately and whorled, Bracteas lanceolate, pointed.—Native of mountains in North America, from Pennsylvania to Carolina, flowering in
PYC

in July and August. Purp. This, like the reef, is perennial. It nearly resembles the last, but differs in having entire leaves, and one or two dense axillary whorls of flowers, beyond the solitary terminal heads. The bracteas are also said to be more pointed.

PYCNI, πυκνός, in the Ancient Myth, was used for such founds or chords of a tetrachord as might enter the psalm, or στάρκαντα. These were the hypate, the parypate, and the lichani, of the several tetrachords. The hypate were called barypycan, ραυρπακάν; the parypate, melopycen, μελοπάκαν; and the lichani, oxyypcnc, ὀξυπακάν; because the first were the lowest notes; the second, the middle notes; and the third, the highest of the psalm. Such chords as could never enter the psalm were called apycnai, ἀπυκνάν, υπεκόκκασια, τρισπακάν, τριαπόκαισια.

Hence, in the Greek scale or diagram, containing eighteen chords, there were five barypycan, as many melepycen, and an equal number of oxyypycnai, together with three apycnai. The apycnai and barypycan were stabiles or fixed chords; but the melepycen and oxyypycnai were movables, or mobiles.

PYCNIATE, in Mineralogy, is the mineral called galinite by Klaproth, leucite by Davy, and chalcous beryl by Werner, who first called it as a sub-species of beryl. It is now arranged with the topaz, to which its constituent parts bear a nearer resemblance. It is remarkable for containing, like the topaz, a portion of fluoric acid. Pycnite is generally found crystallized in long, fixed prisms imbedded in granite rocks. Small four-sided prisms may be obtained by a careful mechanical division from the large crystals; the bases of these are rhombohedrons of angles of 120° and 60°. Bucholz considers this to be the primitive form of pycnite. The colour of this mineral is either various shades of white, passing on one side from greyish and yellowish-white to straw-yellow, or from reddish-white to a peach blossoms and crimson red. Some specimens are marked with spots of violet blue. The crystals are translucent. The crose fracture is imperfectly foliated, with the longitudinal imperfectly small conchoidal. It is harder than quartz, which it scratches, but is easily broken in a direction perpendicular to the axis of the crystals. Its specific gravity is 3.61.

By the analysis of Vanquelin, pycnite contains

<table>
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<tr>
<th>Substance</th>
<th>Purity</th>
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<tr>
<td>Alumine</td>
<td>60</td>
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<td>Beryl</td>
<td>30</td>
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<tr>
<td>Fluoric acid</td>
<td>6</td>
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<tr>
<td>Lime</td>
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<td>Water</td>
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Bucholz makes the proportion of fluoric acid 17 per cent. There is no less difference in the proportion of fluoric acid in different specimens of the topaz, as given by Klaproth and Vanquelin. See Topaz. B.

PYCNON, πυκνόν. See Spissum.

PYCNOTYLE, πυκνόταλην, formed from πυκνός, close, and ταλήν, columns, in the Ancient Architecture, a building where the columns stand very close to one another; one diameter and a half of the column being allowed for the intercolumniation.

The pycnotyle is the smallest of all the intercolumniations mentioned by Vitruvius. Some make it the same with the styyle; others distinguish the latter by its allowing half a module more in the Corinthian intercolumniation.

The pycnotyle, Mr. Evelyn observes, chiefly belonged to the Composite order, and was used before the most magnificent buildings; as, at present, in the peristyyle of St. Peter’s at Rome, confining of near three hundred columns; and which as yet remain of the ancients among the late discovered ruins of Palmyra.

PYCNOTONICS, INCASSANTS, or medicines of an aqueous nature, which have the faculty of cooling and condensing, or thickening, the humours.

The word, in its original Greek, πυκνότονος, signifies something that has the power of thickening.

Purpureus, the neuphar or water-lily; lolanum, &c. are ranked among pycnotics.

PYDNA, in Ancient Geography, a town of Macedonia, in Pieria, on the coast of the Thersian gulf, some miles N. of the river Alaemon. It was near this town that the Romans gained over Perseus the battle which terminated the kingdom of Macedon. Steph. Byz. calls it Cydana.—Alfo, a town of the Rhodians.—Alfo, a mountain on the island of Crete.—Alfo, a town of Asia, in Phrygia, in the vicinity of Mount Ida.

PYE, in English Antiquity. See Pica.

Pye, in Mechanics. See Crab.

Pye, in Ornithology. See Pice.

Pye, Sen. See Pica Marina.

Pye’s Islands, in Geography, a cluster of small islands in the North Pacific ocean, near the W. coast of North America. The southermost forms, in various appearances of it, a very conspicuous peak; its S. extremity is situated in N. lat. 59° 10'. E. long. 210° 21'.

PYGAIA, in the Materia Medica, a name by which some authors have called the ipecacuanha, or vomiting Indian root.

PYGARGA, in Zoology, a species of Antelope; which see.

PYGARGITES, in Natural History, a name given by Pliny and some others of the old writers to the eagle-stone, when it was variegated with white, in the manner of the tail of the eagle, called pygargus.

PYGARGUS, in Ornithology, a species of eagle, called also by some authors albicilla, and bicornudaria. Linnaeus has called this bird among the vultures, calling it the vultur albicilla, because its bill is rather slimmer than is usual in the eagle; but Mr. Pennant observes, that it can have no claim to be ranked with that genus, because the pygargus is wholly feathered; whereas the characteristic mark of the vulture is, that the head and neck are either quite bare, or only covered with down. It is a large and fierce bird, of the size of the common turkey; its beak is yellow, and covered with a yellow membrane at its base; it has large hazel-coloured eyes; its feet are yellow, and its claws extremely strong and sharp; the head is white, and there are no feathers, but some fine hairs between the eyes and nostrils; the upper part of the neck is of a reddish-brown, and the rump black; all the body besides this is of an obscure dull colour, and its wings are partly black, partly grey; its tail is long, and the upper half of it is white, and the rest black. It is from this white part that it has its name albicilla. The male is of a darker colour than the female. This bird inhabits Scotland and the Orkneys, and feeds on fish as well as on land animals.

Authors who have written on this subject seem not at all agreed to call the same bird by this name. The pygargus of Aldrovand seems different from this, and the pygargus prior of Bellonius seems no other than the male of that kind of hawk, called in English the hen-harrier.

Mr. Willoughby imagines his first pygargus, p. 61, to be only a variety of the white-tailed eagle, having the same charac-
characteristic mark, and differing only in the pale colour of the head.

Pygargus, Accipiter, a name by which many authors have called the fubbuteo, a bird of the hawk kind; the male of which is called in English the hen-harrier, and the female suppofed by fome to be the ring-tail. See Falco.

Pyrgela, in Ancient Geography, a town of Asia Minor, in Ionia, where was a temple of Venus Munychian, according to Strabo and Steph. Byz.

Pygmé, πυγμαχος, the length, or extent, between the elbow, and extremity of the hand; the fift being fhort; called also a cubit.

Pygmy, Πυγμαχος, πυγμαχος, formed of πυγμα, cubis, a dwarf, or perfon of exceeding small stature, not exceeding a cubit in height. See Dwarf.

The appellation is given among the ancients to a fabulous nation, said to have inhabited Thrace; who generated and brought forth young at five years of age, and were old at eight; famous for the bloody war they waged with the cranes.

Pygmy, Apes, in Zoology. See Simia Sylvanua.

Pythia, in Geography, a large lake of Sweden, in the province of Savolax, N.E. of Lake Saima, and communicating with it.—Allo, a river of Sweden, which runs into the Gulf of Bothnia, at Brabeftad.

Pyhajarvi, a town of Sweden, in the province of Nyland; 34 miles N.W. of Helsingfors.

Pyhajoki, a town of Sweden, in East Bothnia, near the sea-coast; 10 miles S.S.W. of Brabeftad.

Pyhamaa, a small island in the Gulf of Bothnia, on a peninsula of the coast of Finland. N. lat. 69° 59'. E. long. 21° 12'.

Pykehaus, a town of Bengal; 52 miles S.E. of Pauccolo.

Pyker, or Pykar, in our Writers, a small ship or herring boat.

Pyia, in Geography, a town of the duchy of Warsaw; 48 miles N. of Pofen.—Allo, a river of England, in Monmouthshire, which runs into the Olwy; 2 miles N.E. of Ulke.

Pylaes, in Biography. See Bathyllus, Hylas, Mime, and Pantomime.

Pyleς Persides, in Ancient Geography, a famous trait in Asia, between the Peridea and Sufiana, according to Diodorus Siculus. This trait is named Porta Periche by Strabo, and Pyle Susides by Arrian.

Pylos Sarmitae. Sarmitia is bounded on the S. by mount Caucasus, which separates it from the neighbouring countries. Ptolemy speaks of two traits or paffages in this famous mountain; one called Porte Caucaza, which affords entrance into Siberia; the other named Pyle Albanez, and gives entrance into Albania.

Pylea, a town of Macedonia, in Trachinia, situated at the foot of mount Oeta, according to Phiolaltus. This gave name to the Pylaic gulf, mentioned by Strabo.

Pylea, Πυλες, in Antiquity, a name given to the affembly of the Amphiétyons, as well when they met at Delphi as at Thermopylae. The concourfe of people at these affembles was fo great, that the term pylea came to be used for any very numerous affembly, or crowd of people. Mem. Acad. Infer. vol. iv. p. 287, 290.

Pylagorion, Πυλαγοριον, a name given to the Amphiétyons, because they affembled at Thermopylae, or Pyle.

Pylai, in Geography, a town of Pusilia; 18 miles S. of Konigberg.

Pylé, Θιμασ, in Biography, was born at Stodey, near Holt, in Norfolk, in the year 1674. He received his academical education at Caen college, Cambridge, where he took his degrees, and became an excellent scholar. When inducted to the church, he discharged all the duties attaching to his situation as curate with the most conscientious integrity. His great aim was to amend and improve his hearers, and his discourses and urgent manner gained him the attention for which he was anxious. In early life he took part in the Bangorian controversy, and acquired for himself so much to the satisfaction of bishop Hardly, that his lordship presented him with a prebend, and procured for him a rectoryship in the cathedral church of Salisbury, and likewise made his two sons prebendaries of Winchester. He died in his 84th year. He was greatly admired as a preacher, and no less so as a faithful friend, an agreeable companion, a man of the most liberal sentiments, and so free from all pride and conceit of his own abilities, that he was apt to pay a deference to the opinions of many persons much inferior to himself. Archibishop Herring speaks of him as a worthy man, but who had not at all times the proper government of his own temper. He was author of several works: as “A Paraphrase, with Notes, on the Acts of the Apollines, and Epiftles,” being a supplement to Dr. Clarke’s Paraphrase on the Four Gofpels: “The Scripture Preparative against Popyry; being a Paraphrase, with Notes, on the Revelation of St. John.” He published also, between the years 1715 and 1725, “A Paraphrase, with short and useful Notes, on the Books of the Old Testament.” In 1773, his friends published two vols. of pithymous fermons, to which, in 1783, a third was added. Though these fermons want the care and polish of finished compositions, they are reckoned interesting and highly useful family difcourfes.

Pyler-Rudebar, in Geography, a town of Peria, in the province of Ghilan; 32 miles S. of Rethid.

PYLING the Ground for Foundations. See Foundation, and Pallification.

Pyloric Artery and Vein, in Anatomy, are blood vefids belonging to the ftomach. See Stomach.

Pylorus, the circular ring by which the ftomach communicates with the small intestine. See Stomach.

Pylstart, in Geography, an island in the South Pacific ocean, about six miles in circumference, discovered by Tafman in 1643. It pretends to view two lofty hills, which feem separated from each other by a low valley; it is called by Maurelle “La Sola.” S. lat. 22° 22'. W. long. 175° 59'.

Pylus Meffenia, now Navarin, in Ancient Geography, was fittuated on the western coast of Meffenia, over-againft the island of Aifa.

Pylus (Zoncit), or Avanico Veia, a town of Meffenia, upon the sea-coafl, S.E. of Platamodes.

Pylus Elanus, a town of Triphyla, N.W. of Onus, upon the Ladon.

Pymatuning, in Geography, a town of America, in Mercer county, Pennsylvania; 23 miles W.S.W. of Fort Franklin. It contains 376 inhabitants.

Pynaker, Adam, in Biography, a landscape painter, was born at the village of Pynaker, near Delft, in 1621. Whether his real name was that by which he is known or not, is not now to be ascertained. By an earnest study of the art, first in his native land, and afterwards at Rome, he acquired very considerable skill and celebrity. He generally exhibits brilliant effects of sunshine, in subjects not always happily selected, but executed with great freshness, purity, and taste. In his pictures we frequently fee ruins of elegant and antique buildings, and figures well adapted to the scene.
PYR

In general his pictures are of a small size, and are rather scarce. He died in 1672, at the age of 52.

PYRANG, in Botany, a name by which some authors call the faufal, or areca-tree; a kind of palm, from the expressed juice of which the drug commonly, but improperly, called Japan-earth is made.

PYNY, in Geography, a town of Hindoostan, in Comorob.; 18 miles S. of Daraporum.

PYONY WATER. See Water.

PYRACANTHA, in Botany, a name given by some authors to the lyrium, or box-thorn.

PYRÆA, or PYRETHEA, among the Eastern Nations of Antiquity, were great inclosures uncovered, and dedicated to the sun, in which a perpetual fire was kept up in honour of this luminary, which was worshipped by most of them. See CHAMANIA.

PYRALIS, the firefly, a name given by authors to a supposed insect, which they say is produced in the violent fires of the galls and metal furnaces. Plin. lib. ii. c. xxxvi. See LAMPIRIS.

PYRAMID, pyramis, in Geometry, a solid standing on a square, triangular, or polygonal base, and terminating at top in a point; or a body whose base is a regular rectilinear figure, and whose sides are plain triangles; their several vertices meeting together in one point.

Euclid defines it a solid figure, consisting of several triangles whose bases are all in the same plane, and have one common vertex.

Wolthus defines it a solid, bounded by as many triangles, A D C, D C B, and A D B, terminating in one point D, as the base A B C has sides. Plate XI. Geometry, fig. 18.

The pyramid is said to be triangular, quadrangular, quinquangular, &c. according as the base is triangular, quadrangular, &c. The pyramid may be called a square, triangular, &c. cone; or the cone a round pyramid.

PYRAMID, Properties of the. 1. All pyramids and cones standing on the same base, and having the same altitude, are demonstrably to be equal.

2. A triangular pyramid is the third part of a prism, standing on the same base, and of the same altitude.

3. Hence, since every multangular may be divided into triangulars, every pyramid is the third part of a prism, standing on the same base, and of the same altitude.

4. If a pyramid be cut by a plane, a b e, parallel to its base, A B C, the former plane, or base, will be similar to the latter.

5. All pyramids, prisms, cylinders, &c. are in a ratio compounded of their bases and altitudes; the bases, therefore, being equal, they are in proportion to their altitudes; and the altitudes being equal, they are in proportion to their bases.

6. Similar pyramids, prisms, cylinders, cones, &c. are in a triplicate ratio of their homologous sides.

7. Equal pyramids, &c. reciprocate their bases and altitudes; i.e. the altitude of the one is to that of the other, as the base of this to the base of that.

8. A sphere is equal to a pyramid, whose base is equal to the surface, and its height to the radius of the sphere.

Pyramid, to measure the surface and solidity of a. Find the solidity of a prism that has the same base and height with the given pyramid. And divide this by three; the quotient will be the solidity of the pyramid. Or, multiply the base by the perpendicular height; and one-third of the product will be the content.

Suppose, v. gr. the solidity of the prism be found 67010328, the solidity of the pyramid will be thus found 22336776.

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modern writers. Herodotus (lib. ii.) makes the base of it to be 820 Grecian feet long; Diodorus (lib. i.) 700; Strabo (lib. xvii.) less than 600; and Pliny (lib. xxxvi. c. 12.) 883. Among the moderns, Sanders found it to be 300 paces; Bellumius 324; Greaves 693 English feet; Le Bruyn 704 French feet, or 750 English feet; Proper Alpinus 750 French feet; Thevenot 682; Niebuhr 710; Chazelles 764.80 English feet. In order to reconcile these differences, Dr. Shaw observes, that none of the sides of this pyramid are exactly upon a level; so that it is difficult to find a true horizontal base; besides, it is impossible to say how much the drifts of sand, to which it is exposed, may have been accumulated above the foundation of it; and, therefore, all calculations depending upon the time and circumstances of the situation, when they were made, must be exceedingly precarious. The perpendicular altitude of it, according to Greaves, is 499 feet; but its oblique height is equal to the breadth of the base, or 693 feet. The whole area of the base contains 480,249 square feet, or 11,484 English acres. The height, according to Herodotus, is 800 French feet; according to Strabo 625; according to Diodorus Siculus 600 and a fraction; as stated by Le Bruyn 616; by Proper Alpinus 625; by Thevenot 520; by Niebuhr 440. The ascent to the top of the pyramid is by steps, the lowermost being near four feet high and three broad; the second of the same dimensions, but retiring inward from the first near three feet; and in the same manner the third is placed upon the second, and the rest in the same order to the top, which terminates in a small flat or square, and they are so disposed, that a line stretched from the bottom to the top would touch the angle of every step. These steps are called by Herodotus little altars; on account of their form; and their number has been variously assigned; Greaves states them at 227; Maillet at 208; Pococke at 212; Belon at 250; Thevenot at 208, and Chazelles at 498.222 English feet. For a description of the inside of this pyramid, we must refer to Greaves, Savary, &c. infra.

This pyramid, being that already described, is situated on a rocky hill, in the sandy desert of Libya, about a quarter of a mile from the plains of Egypt, above which the rock rises 100 feet or more, with a gentle and easy ascent. Upon this advantageous elevation, and solid bafs, the pyramid is erected: the height of the situation adding to the beauty of the work, and the solidity of the work affording it a stable support.

We may here observe, that the sides of this pyramid stand exactly facing the four quarters of the world, and consequently mark the true meridian of the place: which precise position could not have been well owing to chance, but was, probably, the effect of design and art; and this is said to be confirmed by the position of the tomb itself, which lies within it. We may hence infer that the Egyptians had made an early progress in astronomy.

The second pyramid stands at about a bow-shot from the first, towards the south of this. Herodotus says, after having measured both, that it falls short of the other in magnitude; that it has no subterraneous chambers, and that the Nile is not conveyed into it by a channel, as into the former, but that it is of an equal altitude. Diodorus informs us, that it resembles the first in its architecture, but is inferior to it in magnitude; each side of the base containing a stadium, or 600 Grecian feet in length, so that by his computation each side is less than the of the former in length by 100 feet. Pliny makes the difference to be greater by 46 feet. Thevenot lets it but 631 feet square. Strabo supposes these pyramids to be equal, and Greaves affurs us, that the bases of both are alike, and that the height is not inferior to that of the first. This pyramid has no entrance like the other, and is built of white stones, not near so large as those of the first: the sides do not rise with gradations, but are smooth and equal, and the whole fabric, except on the south side, is quite entire. On the N. and W. sides of this second pyramid are two very flatly and elaborate pieces of architecture, about 30 feet in depth, and about 1400 in length, cut out of the rock in a perpendicular direction and squared by a chisel; supposed to be designed for the lodging of the Egyptian priests.

The third pyramid stands at about the distance of a full length from the second, on an advantageous rising of the rock, so that at a distance it appears equal to the former, though it be much less and lower. Herodotus says that it is 300 feet on every side, and to the middle, built of Ethiopean marble. Diodorus gives the same dimensions of its base, and adds that the walls were raised fifteen stories with black stone, like Thebaic marble, and the rest finished with such materials as the other pyramids are built with; that this piece of work, though it be exceeded by the two former in magnitude, yet far excels them in respect to the structure, art, and magnificence of the marble; and that on the side towards the north, the name of Mycerinus, the founder, is engraved; but this inscription has been defaced by time. Pliny writes to the same effect, except that he makes this pyramid 363 feet between the angles.

Dr. Shaw apprehends, that neither of these pyramids was ever finished, supposing that the steps already mentioned should have been filled up with prismatical stones, so that each side of the pyramid might be smooth and level, like that of Celsius at Rome.

But from the description of Maillet and Savary, the first pyramid appears to have been covered with a coating of marble, and thus finished on the outside, but closed; and that it has been since forcibly opened, and the stones which flit the passagle and were of an enormous size have been removed. This passagle was composed of marble, and the stones which form its four sides are of the finest white and hardest marble. For other particulars we refer to Greaves, Maillet, and Savary.

The ancients inform us, that the stones of the pyramids were brought from the mountains of Arabia, and Herodotus (lib. ii. c. 124.) has described the manner in which they were conveyed; but Dr. Shaw imagines, that they were taken from the spot where they were employed; and he observes, that the greatest of them, especially, is not an entire heap of hewn stones, because that portion of it, which lies below the horizontal section of the entrance, may probably be no more than an incrustation of the natural rock on which it is founded. Dr. Bryant conjectures, that, like the sphynx, which stands directly in the front of the second pyramid, they were immense rocks which stood upon the brow of the mountain; that the Egyptians caved them over with large stones, and brought them by these means to a degree of symmetry and proportion. At the same time they filled up the unecessary interstices with rubbish and mortar, and made chambers and apartments, as the intervals in the rock allowed, being obliged to humour the indirect turns and openings in the original mals to execute what they proposed. This he infers from the narrowness and unnecessary sloping of the passages, which are often very close and steep, and also from the fewness of the rooms in a work of so immense a structure. That the pyramids were built upon a rock in the place where they now
PYRAMID.

Now stand, was suggested by Mr. Hooke. See Birch's Hist. Royal Society, vol. iv. p. 245.

It is very surprising that the pyramids, which have been reckoned among the wonders of the world, should not have preferred a more certain era, and tradition of the names of their founders. Play, reckons a number of authors who have wrote concerning them; and all, he informs us, disapprove in their accounts of those who built them. Some modern writers maintain, that they were erected by the Egyptians, under the tyranny of the Pharaohs, and allege to this purpose the testimony of Josephus, Antiq. lib. i. cap. 5.

According to the relations of Herodotus (lib. ii.), and Diodorus (lib. i.), the first pyramid was erected by Cheops, or Chemmis, a king of Egypt, who is said to have employed three hundred and sixty thousand men for twenty years in its structure. Cephen, brother and successor to the former king, is said to be the founder of the second pyramid; and the third is said to have been built by Mycerinus, the son of Chemmis, according to Diodorus, but according to Herodotus, of Cheops. However, Herodotus says, that some ascribed the left to Rhodope, a courtzan, and the other two to the shepherd Philanth. The learned Greaves places the three kings who erected these pyramids in the twentieth dynasty; Cheops having begun his reign in the year 3448 of the Julian period, 400 years before the first olympiad, and 1266 years before the Christian era. He reigned fifty years, says Herodotus, and built this pyramid, as Diodorus observes, 1000 years before his time, or in the 180th olympiad; whereas, he might have lived 1207. Cephen, the builder of the second, reigned fifty-fix years; and Mycerinus, the builder of the third, seven years.

Dr. Bryant gives a different account of the origin of these pyramids: he ascribes the structure of them to the Cuthites (see Dispersion of Mankind), or Arabian shepherds, who built Heliopolis, and who were the giants and Titans of the first ages. These sons of Chus, according to this writer, seem to have come into Egypt immediately after their dispersion from Babel.

Many have considered these ancient structures with contempt, as being vast piles without any great symmetry, and have thought the labour idle, and the expense unnecessary. Thus Pliny (lib. xxxvi. cap. 12.) calls them regum pecunio atrofa ac fluita olenation, &c. built for ostentation, to keep an idle people employed, and to prevent commotion and rebellion. Arriistle (Polit. lib. iii.) calls them the work of tyranny.

The general opinion with regard to their intention and use is, that they were sepulchres and monuments of the dead, particularly of kings. This is expressly affirmed by Diodorus (lib. i.), and Strabo (lib. xvii.), and the opinion is confirmed by the writings of the Arabsians. And the reason, says Greaves, of their erecting these magnificent structures is founded in the theology of the Egyptians, who, as Servius shews in his comment upon Virgil (Aeneid, lib. iii.), where he describes the funeral of Polydorus—Animamque sepulchro constrictus—believed, that as long as the body endured, so long the soul continued with it; and this was also the opinion of the Stoics. Upon this principle, that the bodies might neither be reduced to dust by putrefaction, nor converted into ashes by fire, they embalmed them, and laid them up in these lately repositories, where they might continue free from the injury of time and of men. The reason of their building their sepulchres in the form of pyramids, was either from a notion that this was the most permanent form of structure, or because they hereby intended to represent some of their gods: particularly, as Greaves conjectures, Osiris, or the sun with many rays; for, under this form, the statues of the gods were frequently exhibited, and the gods themselves worshipped.

Among the Egyptians, the pyramid is said to have been a symbol of human life; the beginning of which is represented by the bafe, and the end by the apex; on which account it is that they used to erect them on sepulchres.

Herodotus.

Some, however, have objected to this design of the Egyptian pyramids, and are of opinion that they were originally intended for some nobler purpose. If Cheops, or any other person, was the founder of the great pyramid, intended it only for his sepulchre, what occasion was there for such a narrow crooked entrance into it; for the wall, as it is called, at the end of the entrance; for the lower chamber, with a large nitch or hole in the external wall of it; for the long narrow cavities in the walls of the upper room; or, for the two anti-chambers and the lofty gallery, with benches on each side that introduce us into it?

As the whole of the Egyptian theology was clothed in mysterious emblems and figures, it seems reasonable to suppose, says this writer, that all these tumbling, apartments, and crypts in architecture were designed for some purpose of religion, and that the Deity, which was typified in the outward form of this pile, was to be worshipped within. The square chest of granite marble, which is placed in the upper chamber of the great pyramid, may be supposed to have been rather intended for some religious use than for the coffin of Cheops. It might have served for one of their sacred chests, in which either the images of their deities, or their sacred vestiments or utensils were kept, or it might have been a hypocon or cistern, such as contain the holy water used in their ceremonies. Its length favours the opinion of its having been designed for a coffin, but its height and breadth far exceed the dimensions that were adhered to on such occasions; the Egyptian stone coffins were made of a different form, and inscribed with hieroglyphics. Nor is this chest placed according to the manner in which the Egyptians deposit their dead; for their mummys always stand upright, whereas this chest lies flat upon the floor. If, therefore, this chest was not intended for a coffin, it is inferred that the pyramid itself could not have taken the name of a sepulchre from it.

Cheops, indeed, and others might have been buried within the precinct of this or any other of the pyramids, and this was no more than was practised in other temples, and therefore could not destroy the principal use and design for which they were erected. Upon the whole, Dr. Shaw concludes, from the outward figure of these piles, the structure and contrivance of the several apartments in the infide of the greatest, together with the ample provision that was made on each side of it for the reception, as may be supposed, of the priests, that the Egyptians intended the latter for one of the places, as all of them were to be the objects, at least, of their worship and devotion.

Dr. Bryant has lately maintained, with considerabfe force of argument, this opinion, that the pyramids were designed for high altars and temples, and were constructed in honour of the Deity. If the chief pyramid were designed for a place of burial, what occasion, says he, was there for a well, and for passageways of communication, which led to other buildings? The apartments near the pyramids he supposes to be designed for the reception of priests, and to be appendages not to a tomb, but to a temple of the Deity.  

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The stone coffin, he apprehends, was a trough or reservoir for water, which, by means of the well, they drew from the Nile. The priests of Egypt delighted in obscurity, and they probably came by the subterraneous passageways of the building to the dark chambers within; where they performed their labors, and other nocturnal rites. Many, he adds, of the ancient temples in this country were caverns in the rock, enlarged by art, and cut out into numberless dreary apartments; for no nation upon the earth was so addicted to gloom and melancholy as the Egyptians. From the top of the pyramids they observed the heavens, and marked the constellations; and upon the fame eminence it is probable that they offered up vows and oblations. See on this article Greaves's Works, vol. i. p. 1, &c. Shaw's Travels, fol. p. 413, &c. Pococke's Description of the East, vol. i. p. 41, &c. Perry's View of the Levant, p. 413, &c. Bryant's Analysis of Ancient Mythology, vol. iii. p. 523, &c. Farmer's Worship of the Human Spirits, &c. p. 379, &c. Savary's Letters, vol. i.

The tomb of Portena, king of Etruria, at Clusium in Italy, is a ancient monument of square stone, each side of which is three hundred feet broad, and fifty feet high. Within the square base there is an inextricable labyrinth; upon this square there stand five pyramids, four in the angles and one in the middle, five feet-five feet broad at the bottom, and a hundred and fifty feet high, and terminating in a point at top they are covered with a bract circle, from which are suspended bells, which are put in motion by the wind, so as that their sound may be heard at a great distance. Upon this circle there are four other pyramids, each a hundred feet high, above which, upon one plane, there are five other pyramids. Such is the account which Pliny gives from Varro, lib. xxxvi. cap. 13.

PYRAMID, Scenery of. See Scenery.
PYRAMID, Optical. See Optical Pyramid.
PYRAMIDAL FOUNTAIN. See Fountain.
PYRAMIDAL MIRRORS. See Mirror.

Pyramidal Numbers are the sums of polygonal numbers, collected after the same manner as the polygonal numbers themselves are extracted from arithmetical progression. See Numbers.

These are particularly called first pyramids. The sums of first pyramids are called second pyramids. And the sums of those third pyramids, &c., are called, ad infinitum. Particularly, those arising from triangular numbers are called prime triangular pyramids; those arising from pentagonal numbers are called prime pentagonal pyramids, &c. The numbers 3, 4, 10, 20, 35, &c. formed by the addition of the triangular numbers 1, 1, 3, 6, &c. are usually called by the simple name of pyramids; and the general formula

\[ \text{for finding them is } n \times \frac{n^2 - 1}{2} \times \frac{n^2 - 2}{3} \text{; i.e. the fourth pyramid may be found by substituting } 4 \text{ for } n; \text{ the fifth, by substituting } 5 \text{ for } n, \text{ &c.} \]

PYRAMIDALIA Corpora, in Anatomy, two prominences in the medulla oblongata. See Brain, and Nervous System.

PYRAMIDALIS ABDOMINIS, one of the abdominal muscles. See Obliques.

PYRAMIDALIS NASI, a name given by some anatomists to that portion of muscular fibres which descends from the front occurs in the side of the nose. See Epi-

PYRAMIDOID, called also parabolic spindle, a solid figure, formed by the revolution of a semiparabola round one of its ordinates.

According to the method of indivisibles, this may be conceived to consist of an infinite series of circles, whose diameters are all parallel to the axis of the revolving parabola.

The parabolic spindle is equal to \( \frac{2}{\pi} \times \text{th of its circumference cylinder. See Spindle.} \)

PYRAMIDOID, Parabolic. See PARABOLIC PYRAMIDOIDS.

PYRAMIDS, in Geography, rocks in the Eif Indian sea, near the E. coast of the island of Myof. S. lat. 1° 55'. E. long. 130° 59'.

PYRAMUS, Gideon, in Ancient Geography, a river of Asia, rising in the country of Cataonia, where it begins to be navigable, and traversing mount Taurus through the rocks, it enters the plain of Cilicia, passes by the foot of the mountain of Azanbarus, and leaving it to the right, throws itself into Moppeute, and at length loses itself in the Mediterranean, at the point where was formerly situated the town of Megaris.

PYRAUM, in Geography, a town of Bavaria, and capital of a lordship united to Salzburg; 13 miles S.E. of Nuremberg.

PYRENEUM Promontorium, Cape de Creus, in Ancient Geography, a promontory of Hispania Citerior; which terminates the Pyrenees eastwards, and projects into the sea.

PYRENEUS Salutis, a name given by Cornelius Nepos and Livy to that part of the Pyrenean mountains which Hannibal traversed in his way to Italy, passing from Spain to Gaul.

PYRENE, a town of Gallia Celtae, near the place where the Danube rises, according to Herodotus.

PYRENE, in Natural History, the name of a stone found always in the shape of the stone of an olive. It is of the laps Judaeus kind, being no other than the petrified spine of some species of echinates.

PYRENEES, in Geography, a chain of mountains, celebrated since the time of Herodotus, forming the boundaries between France and Spain, and extending from the Mediterranean to the Atlantic, about 200 miles in length, and in its greatest breadth 100 miles. Its various branches are distinguished by different names, and may be considered as belonging either to France or Spain. The highest summits of these mountains, which are in the centre of the chain, have presented to the research of the naturalist not only calamitous appearances, but even shells. The highest elevation of the Pyrenees is Mont Perdu, for an account of which, we refer to that article. The Canigou was formerly reckoned the highest summit, though it does not exceed 8444 English feet. Other noted heights are Tucarcory, Marboré, the pic de Midi, 9300 feet high, the pic de los Reyes, 7620 feet high, the pic d'Offano, 11,100 feet in height, the pic d'Ari, the Niéu Vallée, the Vigne Marn, La Breche de Roland, &c. At a distance the Pyrenean chain appears like a shaggy ridge, presenting the segment of a circle fronting France, and defended at each extremity till it disappears in the ocean and Mediterranean. Thus, at St. Jean de Luz, only high hills appear, and in like manner on the east beyond the summit Canigou, the elevations gradually diminish. The highest summits are covered with perpetual snow. Blocks of granite are interfused with vertical bands, argillaceous and calcareous, the latter primitive or secondary, and supplying the marbles of Campan and Antin, of beautiful red spotted with white, though the general mountain mass be grey. To the S. and W. the Pyrenees present nothing but dreadful sterility, but on the N. and E. the defect is more gradual, and affords frequent woods and pastures. Besides the dreadful fall of rocks,
rocks, undermined by the waters, they are exposed to Lavanges, or the impetuous defile of vult mates of snow, called Avalanches in Switzerland, and have their glaciers and other terrific features of the Alps.

The opinion of Ramond, that the summit of mont Perdu (which last) must have been covered by the sea, is confirmed by Lapérouse, (Journ. des Mines, N° 46.) A singular feature of the Pyrénées consists of "boules," as they are called, or walls dipping in a circular form. Near the summit of mont Perdu is a considerable lake, more than 9000 feet above the level of the sea, which throws its waters to the E. into the Spanish valley of Béarnis; and which the travellers allege as a proof that mont Perdu really belongs to Spain, and that the Taccoaroy forms the boundary. Lapérouse suggests it as probable that the sole access to the summit of mont Perdu will be found on the side of Spain; there being three summits called by the Spanishards "Las Tres Sorellas," or the Three Sisters; the highest being to the N., and the lowest on the S., but separated by large glaciers. Hence he infers the existence of chains of mountains, in which bands of granite, porphyry, trap, hornblende, and potas-

flex, alternate vertically with primitive limestone, and are so intermingled as to prove a common origin. But in the Pyrénées these bands are surmounted by secondary limestone, replete with marine fossils, and containing even skeletons of animals, so that he concludes that the highest mountains of the chain must have yielded to the fury of the ocean, and that the secondary parts only now exist. Mr. Townsend (Spain, i. 89.) observes, that the limestone and schists feed the vegetation on the N. of the Pyrénées, while the S. is barren, and confined to granite; while, in fact, mountains are generally barren and precipitous on the S. and W., because the most violent rains and tempests come from these regions. Pinkerton's "Geog. vol. i."

The passages over these mountains from one country to another are five; the three principal of which are from St. Sebastian to St. Jean de Luz; from Pamplona to St. Jean de Luz; and from Jacqauera to Perpignan. These mountains afford quantities of timber for shipping, which are conveyed, by means of the Ebro and other streams to the sea, with abundance of pitch and tar. The Pyrénées give name to three of the French departments.

Pyrénées, Baixara, one of the nine departments of the southern region of France, in N. lat. 42° 46', formerly Rouffion, bounded on the N. by the departments of the Arriere and the Aude, on the E. by the Mediterranean, on the S. and W. by Spain; about 58 miles from E. to W., and from 18 to 25 from N. to S., or 28 Fr. leagues in length, and 15 in breadth, containing 73,373 square miles or 212 square leagues, and 175,764 inhabitants; it is divided into 3 districts, 17 cantons, and 249 communes. The three districts are Perpignan, including 31,961 inhabitants, Ceret, 24,759, and Frades, 48,693. According to Haffenfratz, the number of circles is 3, of cantons 25, and of inhabitants 1,14,175. The contributions in the 11th year of the French era amounted to 1,010,220 fr., and the expenses for administration, education, &c. to 181,961 fr. 85 cents. The capital is Perpignan. This department is fertile in corn, wine, oil, flax, hemp, fruits, and pastures. On the hills there is little wood, but variety of medicinal plants and herbs. There are several lofty mountains on the S. and W. boundaries, as Massane, Canigou, &c.

Pyrénées, Lower, a department of France, in the S.W., or Garonne region, composed of Bear, Navarre, Basque-Francais, with a part of Chalofia and of Landes, in N. lat. 43° 16', and bounded on the N. by the departments of the Landes and Gers, on the E. by the department of the Upper Pyrénées, on the S. by Spain, and on the W. by the sea; 70 miles in length, and from 15 to 45 in breadth, or 16 Fr. leagues in length and 10 in breadth. It contains 8072.3 square kilometres, or 388 square leagues, and 84,030 inhabitants. It is divided into 5 districts, 40 cantons, and 660 communes. The districts or circles are, Pau, including 90,486 inhabitants, Oloron, 69,484, Mauléon, 65,447, Bayonne, 69,486, and Orthez, 86,127. According to Haffenfratz, its circles are 6, its cantons 44, and the number of its inhabitants 138,539. Its capital is Pau. Its contributions in the 11th year of the French era amounted to 1,753,760 fr. and its expenses for administration, &c. to 205,170 fr. 66 cents. This department, bounded on one side by the Pyrénées, and on the other by the ocean, presents a great variety of soil and diversity of prospect. The mountains are crowned with woods; the hills are covered with vines; the valleys are rich and populous; the heaths are wild and uncultivated. The plains yield wheat, rye, barley, oats, millet, flax, fruits, and pastures. It has mines of silver, copper, iron, quarries of marble, granite, flint, and mineral springs.

Pyrénées, Upper, a department of France, in the Garonne region, formerly Bigorre, in N. lat. 43°, bounded on the N. by the department of the Gers, on the E. by that of the Upper Garonne, on the S. by Spain, and on the W. by the department of Lower Pyrénées; 20 Fr. leagues long and 16 broad, or 53 English miles in length, and from 25 to 38 in breadth; a small district towards the N. being scarcely more than seven miles in breadth. It contains 4937½ square kilometres, or about 235 square leagues, and 206,680 inhabitants. It is divided into 3 districts, 26 cantons, and 501 communes. Its districts or circles are Tarbes, including 87,005 inhabitants, Bagnères, 78,099, and Argelès, 41,376. According to Haffenfratz, its circles are 5, and cantons 30, and the number of its inhabitants 188,690. Its capital is Tarbes. Its contributions in the 11th year of the French era amounted to 893,637 fr. and its expenses for administration, &c. to 173,759 fr. 12 cents. The plains in this department yield little wheat, but abundant crops of rye, barley, and millet, excellent wine, flax, and pastures. The hills produce considerable forests, with mines of iron and lead, quarries of marble, flint, and mineral springs.

Pyrénoides Processus, in Anatomy, a process of the second vertebra of the neck; called also odontoides, and densiformis, or the tooth-like processes.

The word *pyrénicae* is formed of *pyrên* nucleus, *kerneil*, or *berry*, and *sides*, figure.

Pyrethrum, in Botany, an ancient Greek name, adopted by Haller, Gartner, and the writer of the present article, who are followed by Willdenow and Aiton, for the genus in question, on account of its resemblance to the *pyrénicae* of Dioscorides. The latter is, however, the *Antimias Pyrethrum* of modern writers, or Pellitory of Spain; owing its Greek appellation to the fiery or pungent flavour of the root; whence also it obtained the Latin name of *Santaria*, because it cauets so remarkable a flow of itspia. Our present *Pyrethrum* is made up of several Linnaean species of *Chrysanthemum* and *Matricaria*, with some new ones.—Haller Helvet. v. 1. 405. Sm. Fl. Brit. 500. Wild. Sp. Pl. v. 3. 2150. Ant. Hort. Kew. v. 5. 97. Pursh v. 2. 527. Gardn. t. 169.—Clafs and order, *Synge*


Gen. Ch. *Common Calyx* hemispherical, imbricated; the scales close-pressed, rather acute, membranous at the edges. *Cor.* compound, radiated. Florets of the disk perfect, numerous,
numerous, tubular, funnel-shaped, with five spreading segments; those of the radius more than 12, female, ligulate, elliptic-oblong, three-toothed. Stem in the perfect florets. Filaments five, capillary, very short; anthers united into a cylinder, hardly fo long as the corolla. *Pil.* German, in all the florets, oblong; style thread-shaped, longer than the stamens; stigma two, divaricated, abrupt. *Peric.* none, the calyx remaining unaltered. Seeds nearly alike in all the florets, oblong, quadrangular, each crowned with an erect, membranous, more or less lobed border. *Recept.* naked, dotted, convex.


Section 1. *Radius white; rarely reddish.*

1. *P. frutescens.* Shrubby Feverfew. Willd. n. 1. *Ait.* n. 1. (Chrysanthenum fruticosum; Linn. Sp. Pl. 1251.) Leucanthemum canariense, *fapore pyrethri*; Walth. Hort. 31. t. 24. Buphthalmum canariense leucanthemum; Pluk. Almag. 73. (Willd. t. 272. f. 6.) — Stem shrubby. Leaves feathery, pinnatifid, linear, toothed; three-leafed at the extremities. Native of the Canary Islands, from whence it was brought very early; flowering in the green-house most part of the year. The woody *stem* is much branched. The *flowers* are crowded about the ends of the branches, and in their feathery texture, as well as linear forked figure, resemb line those of a *Crepidum*, or *Artemisia*. The *flowers* are terminal, solitary, on long naked stalks, and resemb line a white daisy.

2. *P. simplicifolium.* Simple-leaved West Indian Feverfew. Willd. n. 2. (Matricaria?; *prostrata*; Swartz Ind. Occ. v. 3. 1366.) — Leaves obovate; toothed at the extremity. Stalks axillary, single-flowered. Branches prostrate. Gathered by Von Rohr in Curacoa and the neighboring islands. It has never been brought alive to Europe. *Stem* herbaceous, branched, decumbent, round, downy, especially the ends of the branches. *Leaves* alternate, nearly fleshy, wedge-shaped, obovate, or roundish, half an inch long, downy, ribbed, notched or serrated; mostly accompanied by two minute leaves at the base. Stalks opposite to the leaves, thickish, an inch long, erect, downy, each bearing a yellowish-white, nearly globose, *flower*, whose disk is entirely yellow. *Seeds* crowned with a quadrangular middle border. *Sauria.*

3. *P. ptarmicifolium.* Goose-tongue Feverfew. Willd. n. 3. *Ait.* n. 2. — Leaves linear, finely serrated. Flowers corymbose. — Native of mount Caucasus. Sir Joseph Banks sent it to Kew in 1803. Willdenow describes this as perennial, with the habit of *Achillea Ptarmica*, only the flowers are twice as large. The *stem* is branched, either erect or decumbent. *Leaves* an inch long, very finely and sharply serrated. *Corymbs* terminal, simple, the stalks fleshy. *Radiant flowers* ovate. *Crown* half the length of the seed.

4. *P. ferrutum.* Creeping-rooted Feverfew. Willd. n. 4. *Ait.* n. 3. Pursh n. 1. (Chrysanthenum ferrutum; Linn. Sp. Pl. 1251.) *Jacq.* Obs. f. 4. 8. 1. 90. *Bellis americana*, procereus, ferotina, ramosa, flore amplissimo; Pluk. Almag. 65. (Phys. t. 17. f. 2.) — Leaves lanceolate; the lower ones strongly serrated; the upper entire. Branches corymbose. — Supposed to be a native of North America; but Michaux has it not, and Pursh merely saw a specimen in Mr. Lambert's herbarium, probably, like that of *Linnaeus*, from a garden. The plant was cultivated by Miller, and is a hardy perennial, flowering in October or later. Its *stem* is herbaceous, two or three feet high, much branched, lefthy, furrowed and angular. *Leaves* alternate, feathery, two or three inches long, and half an inch wide, entire or sparingly serrated in the upper parts of the stem, but mostly furnished, in our specimen, with a sharp tooth on each side of the base, which we do not find mentioned by authors. The *flowers* are terminal, solitary, much like our common *Chrysanthenum Leucanthemum*, but rather smaller.


6. *P. Halleri.* Hallerian Feverfew. Willd. n. 6. *P. n. 97; Hall. Helvet. v. 1. 41. *Leucanthemum alpinum* tenuifolium; *Bail.* t. 458. f. 3.) — Stem leaves lanceolate, deeply toothed; radical ones pinnatifid, on long stalks. *Stem* single-flowered. — Native of the Swiss Alps, in flouy places. The *roots* are creeping, black, long and flender, with very long fibres. *Stem* solitary, simple, lefthy, ascending, three or four inches high. *Leaves* smooth; the lowermost short, wedge-shaped, deeply pinnatifid, on long stalks; the uppermost feathery, deeply and sharply toothed, an inch or more in length. *Flowers* solitary, fliarped, terminal, large; the calyx-ears bordered with black; the radiant florets broad and elliptical. The above figure of Barrellier seems to accord better with our *Swiss* specimens than fig. 5. cited by Haller and his coptists, except that the upper leaves in fig. 3. are too narrow.

7. *P. alpinum.* Alpine Feverfew. Willd. n. 7. *Ait.* n. 4. (Chrysanthenum alpinum; Linn. Sp. Pl. 1253.) *Leucanthemum alpinum*; *Cluf.* Hilf. v. 1. 335.) — Lower leaves wedge-shaped, pinnatifid; uppermost linear and entire. *Stem* single-flowered. — Native of the German, Swiss and Italian Alps. The creeping *roots* throw out many short tufted leafy *flowers*, each bearing one long simple *flower* stalk; downy in its upper part, and furnished below with one, two, or more alternate, simple, linear, entire floral leaves. The *reft* of the *foliage* is flaked, pinnatifid, somewhat peptinate; the segments elliptical, entire, smooth, rather fleshy; each *leaf*, with its flat *stalk*, an inch or more in length. The *flower* is large, much like the last.

8. *P. Balsamita.* Collarv-leaved Feverfew. Willd. n. 8. *Ait.* n. 5. (Chrysanthenum Balsamita; Linn. Sp. Pl. 1252.) *Jacq.* Obs. f. 4. 8. 1. 89. *Leucanthemum orientale*, foliis hortensis folio; *Tourn.* Cor. 37.) — Leaves ovate-oblong, serrated, auricled. Flowers corymbose. — Native of the Levant; rare in our gardens. Mr. Blackburne is said to have cultivated it in his celebrated collection at Orford about 35 years ago. The habit of this species is so much like Common Collarv, *Tanacetum Balsamita* of *Linnaeus*, that one cannot help suspecting they are mere varieties of each other. The preference of a *radius*, in the plant before us, is known, by the examples of *Bidens* and *Coreopsis*, to be no infallible distinction. There is indeed the membranous crown of the seed, as Willdenow remarks, which makes this a *Pyrethrum*, not a *Chrysanthenum*; but such belongs to *Tanacetum* and confirms our supposition, or rather our belief, that the present is but a radiated variety of the Collarv. The *radius* is about twice the length of the *crown*, white, not yellow, as *Linnaeus* seems to describe it.

and half long; their segments lanceolate, toothed at the outer margin, the lower ones deep, the upper gradually confluent into a large cut terminal lobe, and entire. Stalks single-flowered, leafy, alternate, five or six at the top of the stem, composing a corymb. 

**Flowers** the size of *Chrysanthemum Leucanthemum* Willd. 

10. *P. pinnatifidum*. Pinnatifid Feverfew. Willd. n. 10. — "Leaves downy, glaucous, nearly fesile, lyrate-pinnatifid, unequally toothed. Flowers corymbose." — Willdenow described this from living specimens, but did not know their native country. The *fem* is long, with two feet high, branched, frayed, finely downy. Leaves downy on both sides; pinnate at the base; pinnatifid in the middle; cut at the end; their length two or three inches; their segments lanceolate, unequally toothed. *Coriopsis* simple, at the tops of the stem and branches. *Flowers* almost like the common *P. Parthenium*. 

11. *P. macrophyllum*. Large-leaved Feverfew. Willd. n. 11. Ait. n. 6. (Chrysanthemum macrophyllum; Waldst. et Kitaib. Hung. v. t. 97. t. 94.) — Leaves hairy, nearly fesile, pinnatifid, toothed, obtuse. Coriopsis terminal, compound. — Native of the woods and mountains of Hungary. Sir J. Banks introduced it, in 1803, to the Kew garden, where it is a hardy perennial, flowering in July and August. This plant resembles *Actiloba macrophylla*, for which some botanists have mistaken it, but is much larger. We have seen no specimen. 

12. *P. rofeum*. Rose-coloured Feverfew. Ait. n. 7. Willd. Enum. 905. (Chrysanthemum coccineum; Willd. Sp. Pl. v. 3. 21. 11.) Sims in Curt. Mag. t. 1860. Daphniphyllum orientale, tanacetifolium adamiophyllum, magnum coccineum; Tom. Cor. 37. Buxb. Cent. 2. 25. 21. — Leaves smooth, fesile; leaflets once or twice pinnatifid, serrated, acute, spreading. Stem erect, fingle-flowered. Gathered by Tournesort in Iberia. It is found also on the mountains of Caucaias from whence that distinguished cultivator Mr. Loddiges received seeds of this elegant species in 1803. The plant proves perennial and hardy, flowering in August or September. The *fem* is 12 or 18 inches high, more or less leafy, bearing one large handsome *flower*, whose disk is yellow, and the radius of a rich rose colour, or crimson, on its upper side; sometimes varying to white. The *leaflets* are from two to four inches long, fesile, rigid, paler beneath, pinnate, variously serrated, cut or pinnatifid, all the points and serratures very acute. Tournesort gathered plenty of this plant, and his original specimens are dispersed through many collections. 

13. *P. corymbosum*. Mountain Feverfew. Willd. n. 12. Ait. n. 8. (Chrysanthemum corymbosum; Jacq. Altr. t. 379. Ch. corymbiferum; Linn. Sp. Pl. 1251. Tanacetum non odoratum; Ger. Em. 650.) — Leaves pinnate; leaflets lanceolate, pinnatifid, sharply serrated; the upper ones confluent. Flower-talks corymbose. — Native of mountainous woods in Siberia, and many parts of Germany. Gerarde appears, by the catalogue of his garden, to have cultivated it in 1596. The *fem* is perennial, wooly, with long fibres. *Stems* erect, two or three feet high. *Leaves* somewhat like Tanf, but without fesile or taike, except that after a while, according to Jacquin, they cause a heat or pungency in the mouth. The numerous large white *flowers*, each with a bright yellow disk, form an ample terminal *corymb*. 

14. *P. Parthenium*. Common Feverfew. Sm. Fl. Brit. n. 1. Engl. Bot. t. 1234. Willd. n. 13. Ait. n. 9. (Matricaria Parthenium; Linn. Sp. Pl. 1255. Woody Suppl. t. 249. Fl. Dan. t. 674. Matricaria; Ger. Em. 602.) — Leaves pinnate; leaflets oblong, obtuse, pinnatifid and cut. *Stems* branched. *Flowers* corymbose. Radius about twice the length of the calyx. Seed-crown toothed. — Native of cultivated or waste ground throughout Europe, springing up abundantly with us in neglected gardens or court-yards, flowering all summer long. The *root* appears to be rather biennial than perennial. The whole herb is bitter and aromatic, hoary or downy. *Stems* bulky. *Leaves* fleshy, flat and diadate. *Flowers* numerous, each about the size of a common daily, but with a large yellowish disk, and bright white radius. Sometimes the latter is wanting; and more frequently the flowers are double, the disk becoming white and ligulate, like the radius, but each *florin* of a smaller proportion. The *receptacle* is flat. 

15. *P. parthenifolium*. Narrow Hoary Feverfew. Willd. n. 14. — "Leaves pinnate; leaflets oblong, obtuse, pinnatifid, toothed. Stem wand-like. *Flowers* corymbose. Radius thrice the length of the calyx. Seed-crown entire." — Willdenow described this from a garden, without knowing whence it came. He says it is very like the last, but has a taller wand-like *stem*, narrower leaves, a disk but half as large, though the radius is larger, and an entire, not toothed, margin to the *fem*. A plant, now become a weed in Kew garden, and said to have been imported from China, answers precisely to this description in every point, except that its *fem* is scarcely less robust than in *P. Parthenium*. It is difficult to separate, and we are persuaded, though confessing, that it is what Willdenow meant. Its *leaves* are conspicuously hoary, with narrower divisions than those of the last, and the *flowers*, on account of their long and brilliant-white radius, are more striking. We have had no opportunity of investigating the crown of the flower. 


17. *P. sufcatum*. Dingy Feverfew. Willd. n. 16. Sm. Prodr. Fl. Græc. Subh. n. 2095. (Chrysanthemum sufcatum; Desfont. Atlant. v. 2. 253. t. 237.) — Leaves downy, pinnate; leaflets with a few deep linear-oblong segments. *Stems* branched from the base, diffusely. — Gathered by Desfontaines in uncultivated fields near Tunis. Sibthorp found it in Greece. The *root* appears to be perennial, bearing many widely-spread or prominent *flowers*, a fingle long, which are leafy, and slightly branched. The *leaves* are rather fucculent. *Flowers* terminal, solitary, large, with a blackish *calyx*, pale yellowish disk, becoming brown in decay, and broad white elliptical radiate florets. It blossoms in winter. 

18. *P. inodorum*. Corn Feverfew, or Scentless Mayweed. Sm. Fl. Brit. n. 2. Engl. Bot. t. 676. Willd. n. 17. Ait. n. 11. (Chrysanthemum inodorum; Linn. Sp. Pl. 1253. Fl. Dan. t. 696.) — Leaves pinnate, in many capillary segments. *Stems* branched, spreading. Seed-crown entire. — Found in fields and waste ground throughout most parts of Europe, especially where the soil is gravelly, flowering in autumn. *Root* tapering, annual. Herb alomost without any peculiar scent, by which it is readily known, in every state of growth, from *Ambrosia Cotula*. The *fem* is a foot or more in height, widely spreading, clothed with pale-green *leaflets*, entire, with leaflets are deeply and variously divided into linear, almost capillary, pointed segments. More simple segments are numerous.
Pyrethrum.

Numerously crowded about the bottom of each leaf, rendering it, in a manner, lyrate, and surrounding the stem or branch. Branches somewhat corymbose, each terminated by a rather large flower, with long white rays, and a prominent yellow disk. The late Mr. Crowe once found in Norfolk a partly double-flowered variety.

19. P. maritimum. Sea Feverfew. Sm. Fl. Brit. n. 3. Engl. Bot. t. 979. Willd. n. 18. Ait. n. 12. (Materiae maritinae ; Linn. Sp. Pl. 1256. Chamæcemum maritimum paniculatum, folsis brevissimis obtusis viribus; Dill. in Rari Syn. 186. t. 7. f. 1.)—Leaves doubly pinnate; segments linear, pointless, fleshy; convex above; keeled beneath. Stem diffuse. Seed-crown lobed.—Native of the sea-coast in the north of Europe. Found in several parts of Scotland, as well as on the south coast of England, and in Lancashire and Durham, flowering in July and August. The root is perennial. Stems numerous, profuse, spreading circularly to the extent of two or three feet. The leaves are more fleshy than in the foregoing, the disk of the flower broader, in proportion to the length of the rays; and the crown of the disk divided into three or four lobes. The whole herb is slightly aromatic, and of a darker more shining green than inodorum.

20. P. parviflorum. Small-flowered Feverfew. Willd. n. 19.—"Leaves doubly pinnate; leaflets linear-thread-shaped, in two or three deep divisions. Stem erect, branched. Seed-crown two-lobed."—Described by Willdenow from living specimens, but the native country of this species is unknown. It is said to be annual, greatly resembling P. inodorum, but having a taller and upright stem; a shorter radius; and a green two-lobed crown to the seed.

Section 2. Radius yellow.

21. P. multicaule. Many-flaked yellow Feverfew. Willd. n. 20. (Chrysanthenum multicaule; Desfont. Atlant. v. 2. 182. t. 236.)—Leaves simple, smooth, flatulate; the lower ones toothed. Stem erect, much branched from the bottom.—Native of sandy hills near Mafcar, in Barbary. Root fibrous, apparently annual. Stem branched from the base principally, buffy; the branches naked above, each bearing a solitary flower, about as big as a French Marygold, whole radiant flowers are yellow, and of a very broad elliptical form, about eight or nine or number.

22. P. trifurcatum. Three-forked Yellow Feverfew. Willd. n. 21. (Chrysanthenum trifurcatum; Desfont. Atlant. v. 2. 281. t. 235. f. 2.)—Leaves simple, smooth, linear, acute; the lowermost pinnate; the uppermost undivided. Stem acending, single-flowered.—Native of fields near Kerwan in Barbary, flowering in winter. The stem is simple, a foot high; leafy below; naked above; terminated by a very large flower, with numerous yellow radiant florets. Some leaves are partly bipinnate; others three- or four-lobed, the uppermost simple; all linear, wavy, acute, and of equal breadth.

23. P. Bozonti. Dwarf Pale-Yellow Feverfew. Willd. n. 22. (Chrysanthenum aragonense ; Affo Synop. n. 845. t. 9. f. 1. Wild. Bellis mea, chrysantheri cretici folio; Bocc. Muf. 136. t. 80.)—Leaves hoary, flaked, pinnate; leaflets linear-awl-shaped; upper ones linear, undivided, and entire. Stems single-flowered.—Native of Spain and Sicily. Willdenow describes it thus from dried specimens. "Stems many-headed, woody. Stems several, simple, a span high, single-flowered. Leaves hoary; the radical ones flaked, oblanceolate when arriving at maturity, and altogether wanting when the flowers open; lower rem-leaflets flaked, pinnate at the extremity, with three or four pair of very short linear-awl-shaped leaflets, and a membranous linear footstalk; the upper ones linear, sessile, and entire. Rays of the corolla pale yellow. It resembles Chrysanthemum pinnatum, but differs abundantly in the calyx not being membranous, and in having a crown to the seed."

We know nothing of Affo's plant. Willdenow cites an additional synonym, Barbequin's t. 1152. f. 11, which seems to have no affinity to the figure of Boccone, and much more resembles Cineraria minor, Cavan. Ic. t. 35. f. 3, under which indeed Willdenow likewise quotes it, Sp. Pl. v. 3. 286.

24. P. orientale. Oriental Yellow Feverfew. Willd. n. 23.—"Leaves doubly pinnate; leaflets linear. Stems ascending, single-flowered."—Native of Georgia. Stems six inches high, naked above. Lower leaves an inch long; the upper ones half as long, and only singly pinnate. Scales of the calyx withered at the edge. Flowers deep yellow, the size of Chrysanthemum segetum. Willd.

25. P. milkefuliatum. Milkfoil-leaved Yellow Feverfew. Willd. n. 24. Ait. n. 13. (P. n. 174; Gmel. Sib. v. 2. t. 207. f. 1. 2. Chrysanthenum milkefuliatum; Linn. Syn. Veg. ed. 13. 643. Antirhium milkefolia; Linn. Sp. Pl. 1269. Achillea folia foliis &c.; Mill. Ic. t. 9.)—Leaves doubly pinnatifid, linear, blunting. Stems corymbose. Rays half as long as the diameter of the disk.—Native of Siberia. A hardy perennial, flowering throughout the summer. The stem is twelve or eighteen inches high, leafy, branched and corymbose, bearing eight or more long-flaked yellow flowers, whose disk is about half an inch in diameter, and their radiant florets of a short roundish figure, hardly extending a quarter of an inch from the disk. Seed-crown toothed. Leaves doubly and interruptedly pinnatifid, with linear, blunting segments, each tipped with a minute point; their surfaces both downy, or somewhat silky. The leaves, as well as flowers and seeds, are very distinct from Chrysanthemum italicum, to which Linnaeus compares this species.

26. P. bipinnatum. Wing-leaved Yellow Feverfew. Willd. n. 25. Ait. n. 14. (P. n. 172; Gmel. Sib. v. 2. t. 35. f. 1. Chrysanthenum bipinnatum; Linn. Sp. Pl. 1255.)—Leaves doubly or triply pinnatifid; their segments dilated upwards, minutely pointed. Stem nearly simple. Rays wedge-shaped, not a quarter so long as the diameter of the disk.—Native of Siberia, flowering in June. Introduced at Kew by Mr. Buxton, in 1796. This differs from the last in having more compound leaves, whose ultimate segments are almost elliptical, and all their points distinctly awned. But the flowers especially differ in being fower, from one to three on each stem, and furnished with a disk near an inch wide, while the radiant marginal florets are short, broad, and wedge-shaped, with broad spreading teeth. The calyx, as well as all the herbage, is haggy with soft hairs.

27. P. indicum. East Indian Yellow Feverfew. Sims in Curt. Mag. t. 1521. Ait. n. 15.—Leaves pinnatifid; their segments dilated upwards, lobed. Stem branched. Flowers on long flasks, nearly globular. Radiant florets few, very short.—Sent by Dr. Roxburgh, from the East Indies, to A. B. Lambert, esq. It proves a hardy annual in our gardens, flowering most part of the summer. The stem is much branched, but the pinnatifid, though more simple and broader, leaves, betray an affinity to the two last species, which is confirmed by the short yellow radiant florets. These however are, according to Dr. Sims, mostly generally wanting. The flowers are solitary, on long swelling furrowed flasks, terminating each branch; their disk nearly an inch wide, and finally convex. The herbage appears to be smooth.
The distinguishing characters of the pyricubia are these; they are compound, inflammable metallic bodies, of a cubic figure, or resembling a die, being composed of six sides. Of this genus there are only two known species. Hill.

PYRIFORMIS, in Anatomy, a muscle of the thigh, flattened and triangular in its figure, situated at the back of the pelvis, and extending from the facrum to the great trochanter. The posterior surface is covered by the glutus magnus, and partly by the medius. The anterior is partly in the pelvis, partly on the outside of the cavity. Within the pelvis it corresponds to the rectum, the faciculium, and the hypogastric vessels; externally to the cavity it covers the glutaeus minimus, the os innominatum, and the ischial tuberosity. The upper edge corresponds to the faciculium, and the glutaeus artery; it then lies close to the glutaeus medius. The inferior edge corresponds to the lesser faciculium ligament, and then is parallel to the genus superior: it is at first separated from the latter muscle by the great faciculium nerve, and afterwards approaches to, and is united with it.

The basis of the pyriformis is attached to the side of the anterior surface of the facrum, in the intervals of the facet bone; to the lateral areas, to the anterior surface of the great facio-facicular ligament, and to the posterior and upper part of the os innominatum. The muscle proceeds from within outwards, and rather downwards, passing out of the pelvis at the great facio-facicular oramen, gradually diminishes, and terminates in a small tendon, fixed to the upper part of the internal surface of the great trochanter.

The attachment of this muscle to the great trochanter is by means of a tendon, the lower edge of which is connected to that of the superior geminus. This tendon expands into an aponeurosis, which, after extending on the front of the muscle, enters into its substance. The fleshy fibres arise from the parts mentioned above, and are fixed in all directions to the tendon. Sometimes a portion of the faciculium nerve passes through a slit in the muscle.

When the thigh is extended, the pyriformis will rotate it outwards; but when it is bent, it will act as an abductor. If the thigh is fixed, it will move the pelvis in an opposite direction.

PYRIPHELEGES, a word used by the old writers in medicine to express a person labouring under an extreme degree of a febrile heat.

PYRIPOLYGIUM, the name of a genus of fossil, the characters of which are these: they are compound, inflammable, metallic bodies, found in loose detached masses of a simple and uniform, not striated internal structure, and arc covered with an invidious coat or crust.

Of this genus of fossils there are three known species. Hill.

PYRUSCULUS, a word used by the ancients to express a sweeting tree.

PYRITOS, a word used by some authors to express a brick when heated, in order to be applied to the body wrapped up in a cloth by way of a dry fomentation.

PYRICAUSTUM, a word used by medical writers to express a burn or scald.

PYRUCOMIUM, in Natural History, the name of a genus of fossil bodies, usually comprehended, with many others of very different figure and structure, under the general name pyrites.

Vol. XXIX.
PYRITES.

Word πυρίτης, formed of πῦρ, fire, denotes fire-dust; a denomination given to this substance on account of its inflammability. For the mineralogical characters of copper pyrites, and iron pyrites, see Copper Ore, and Iron Ore.

Besides the two named there are auriferous pyrites, auriferous pyrites, and tin pyrites. Combinations of sulphur with the metals are called by chemists sulphurets; and the different kinds of pyrites are properly metallic sulphurets. Sulphur has a great affinity for iron, and in combination with this metal, under the form of pyrites, exists in extensive beds in primary mountains, or is disseminated through the secondary rocks and strata, in veins and marls, or variously crystallized: it occurs also in beds of coal and bituminous clay. Iron pyrites may be considered, after the earths, as one of the most abundant substances in the mineral kingdom, forming a constituent part of the globe, and by its decomposition giving rise to many important subterranean phenomena.

The proportions of iron and sulphur in the different sub-species of iron pyrites enumerated by mineralogists are,

52 to 54 Sulphur
48 to 56 Iron.

Magnetic pyrites differs from common pyrites: its constituent parts, according to Mr. Hatchett, are,

36.50 Sulphur
63.50 Iron.

By the application of heat common pyrites becomes susceptible of action by the magnet; the excess of sulphur being expelled. Iron pyrites is not worked as an ore of iron, but is principally valued for the green vitriol or sulphate of iron, which it affords when exposed to air and moisture. Sulphur may also be obtained from pyrites when heated with charcoal.

The decomposition of pyrites is effected spontaneously by the absorption of oxygen from water and the atmosphere, which converts the sulphur into sulphuric acid, and the iron into an oxyd. These substances unite during the process, and form the sulphate of iron, or green vitriol.

Some kinds of pyrites are rapidly decomposed, others require to have part of the sulphur expelled by heat. The pyrites, or pyritous substance intended to form vitriol, is collected in extensive heaps, spreading the surface as much as can be conveniently done. The ground on which these heaps are spread should be impervious to water, and inclined, in order that the saline matter which effloresces may be washed off, and conveyed into referrers to crystallize. As the decomposition proceeds the mafs becomes heated, and is occasionally moistened, particularly when the air is dry and warm. These beds continue productive for many years, and if the pyrites be pure, but little residue is left. An excess of sulphuric acid is formed during the process, on which account a quantity of old iron is added to the solution, to saturate it, and obtain the salt in a crystallized state. During the decomposition of pyrites much heat is evolved, and a considerable absorption of oxygen from the atmosphere takes place. The fact was first observed by Henckel, who affirmed, in his "Pyrologia," that air was necessary to the process of vitriolization, and that it enters into combination with pyrites and remains fixed in it: "non ut instrumentum transiens sed immansus." This may be considered as a happy anticipation of one of the most important doctrines of modern chemistry. Some geologists have supposed that subterranean fires, and the temperature of hot springs, are occasioned by the spontaneous decomposition of immense beds of pyrites in the interior of the earth, and an experiment made by Lemery gives some plausibility to this opinion. He found that a mixture of iron filings and sulphur, moistened with a small quantity of water, becomes hot in a few hours, the mafs swells, and the parts adhere together: it then breaks with a perceptible noise and cracking, and emits aqueous vapour, and a fetid odour like that of sulphurated hydrogen gas. If the mixture be made in a large quantity, it takes fire in twenty-four or thirty hours. As soon as the emission of aqueous vapour has ceased, the heat becomes greater and greater, is succeeded by inflammation, the smell is then much stronger, and appears to arise from the hydrogen produced by the decomposition of water. Beaumé, who observed this phenomenon from a mixture of one hundred pounds of iron filings, with an equal quantity of sulphur in powder, states that the flames rule to a foot in height, but did not continue longer than two or three minutes; the mafs, however, remained red-hot for forty hours. Lemery the elder gave to this experiment the name of the artificial volcano.

Dr. Watton, in his Chemical Essays, vol. i. p. 187, says that he has repeated this experiment more than once. When made in the open air the flame is of short duration, and the whole mafs after the extinction of the flame, continues at intervals to throw out sparks. A ladle full of the ignited mafs being dropped down from a considerable height, descended like a shower of red-hot ashes. The success of this experiment depends on a due proportion of water. Half a pound of flower of sulphur, with half a pound of clean iron filings, mixed with fourteen ounces of water, and worked into a pate, will acquire heat enough to make the mafs take fire.

Some dark-coloured carbonaceous and bituminous earths contain pyrites in minute grains, and decompose with great rapidity when exposed to moisture. In the month of August 1751, the cliffs near Charnouth, in Dorsetshire, containing a similar kind of pyritic earth, took fire in consequence of a heavy fall of rain after a hot dry season, and continued at intervals to emit flame for several years. Almost all kinds of pit-coal in England contain more or less pyrites: in some the quantity is very inconsiderable, in other kinds it abounds so much as to render them unfit for domestic purposes, and totally inapplicable for forges or iron works, on account of the sulphur which they emit when burned. This pyritic coal may be distinguished by its greater specific gravity, and the brass-like metallic appearance of the pyrites with which it is intermixed. Pyritic coal and coal flake, or bituminous clay, containing pyrites, frequently take fire spontaneously in coal mines, or when exposed in heaps out of the pits, and continue burning many years. Instances of this kind now exist in the north of England; and so intense is the heat produced by the ignition of these malleys, that the coal flake is sometimes fused. We have seen specimens from these heaps which have all the characters of cellular volcanic lava. In the vicinity of Leeds there is a large heap of coal flake which has been on fire near half a century; it is covered in parts with vegetation, and presents no appearance of ignition during the day; but if a dry flake be thrust into it the surface is changed in a few minutes. In some of the coal mines in Leicestershire, near Ashby de la Zouch, the stratum of indurated clay over the main bed of coal contains so much pyritic matter, and is so subject to spontaneous inflammation when it falls down and is intermixed with small coal and moisture, that the miners are obliged to close up the space with brick-clay where the coal has been worked, to prevent the access of air to the combustible matter. In this state, excluded from the air, the pyritic earth sometimes becomes ignited, as is evident by the heat communicated to the neighbouring parts of the mine; but the fire is prevented from spreading among the coal.
coal, by the precautionary measure of closing the cavities with clay.

The great heat evolved during the decomposition of pyrites, may proceed in part from the combination of oxygen with the sulphur and iron, and may be increased by the different capacity of the new compound for heat. Whenever chemical changes take place rapidly, they produce a change in the temperature of substances, as in the well-known infusions of lime and water, nitric acid and vegetable oils, &c.

The phenomena accompanying the mud volcanoes in various parts of the world, present many appearances which give probability to the opinion, that they proceed from the decomposition of pyritic flates. See Volcano.

The formation of alum is also effected naturally, in many situations, by the decomposition of pyrites, the sulphuric acid combining with the alumine of pyritic clay. This is not unfrequently the case in excavations of coal mines that have been long worked out.

At Hartlet, near Glasgow, in the excavations of an old coal mine that has been worked some centuries, there is a very extensive formation of alum, from the decomposition of the roof of the pit. It is a pyritic clay ten inches thick. In the old workings of the mine which are dry, the air circulates slowly, and the roof gradually decomposes and exfoliates, and falls upon the floor, in which situation the decomposition proceeds, and the substance assumes the appearance of a peculiar efflorescence. In time the whole space to the roof is filled; it is then removed. The mafs consists of earth richly impregnated with sulphate of alumine, sulphate of iron, and in fome infiuences with sulphate of magnesia. The coal in this mine, contrary to the usual practice, is worked to the dip, so that the old workings are always dry. To this circumstance may principally be attributed the great accumulation of alum in this mine. In many of the mines in En- gland a similar formation of alum would take place, but they contain too much water to permit the saline substances to remain. In general, alum rock or alum flake require to be exposed in heaps, and burned in the open air, to expel the sulphur, and combine it with the oxygen from the atmosphare. The sulphuric acid thus formed unites with a requisite portion of the clay during the process.

The gypsum, or the sulphate of lime which occurs in beds, among secondary flates of red sand-flone and beds of marl, probably may owe its present flate to masses of pyrites, which have exilted over common lime-flone, and been decomposed naturally. The sulphuric acid thus produced would unite with the lime, and form gypsum. The great quantity of the red oxvd of iron which is in the flone and marl that accompany this kind of gypsum, gives much probability to this opinion. The cryftals of gypsum or felinite found detached in beds of clay had probably a fimilar origin.

Sulphuret of iron may be formed by heating together iron filings and sulphur. From the experiments of Vauquelin it is proved that there are four sulphures of iron, according to the degree of heat and other circumstances under which the combination may be formed. The firit sulphuret consists of

\[
\begin{align*}
78 & \text{ Iron} \\
22 & \text{ Sulphur} \\
\end{align*}
\]

Artificial.

The second sulphuret, of

\[
\begin{align*}
64 & \text{ Iron} \\
36 & \text{ Sulphur} \\
\end{align*}
\]

Natural magnetic pyrites.

The third sulphuret, of

\[
\begin{align*}
54.16 & \text{ Iron} \\
45.84 & \text{ Sulphur} \\
\end{align*}
\]

Artificial.

The fourth sulphuret, of

\[
\begin{align*}
47 & \text{ Iron} \\
33 & \text{ Sulphur} \\
\end{align*}
\]

Natural common pyrites.

When the quantity of sulphur does not exceed 40 per cent., pyrites is soluble in muriatic acid, and may be rendered permanently magnetic. The specific gravity of common pyrites is from 4.6 to 4.83. Of magnetic pyrites 4.51.

Arefenic pyrites, called marasite, is distinguished from iron pyrites by its colour, which is a silver white, and by yielding a smell like garlic when rubbed or exposed to heat. See Arfesic Ores.

Auriferous pyrites, or iron pyrites, with a small alloy of gold; the richest specimens of this ore in Europe are found in Transylvania, containing from 0.02 to 0.03 of gld. These ores are distinguished from iron and copper pyrites by their colour, malleability, and specific gravity.

Tin pyrites. See Tin Ores.

The pyrites, in substance, are never used medicinially; nevertheless, in their products they are very important. From these common sulphur is extracted, in Sweden and Saxony; the native vitriols are produced in caverns of the earth, or on its surface; the greatest quantities of artificial vitriol are prepared; and the mineral waters, vitriolic, aluminoius, sulphureous, hot or cold, are supposed to receive their impregnation.

When the matter of the pyrites is mixed with the lead ores, the method of separating the metal by affaying is this: roast two centners of the ore, as in the usual method, and keep a stronger fire than when the ore is pure. The pyrites, especially when it is merely iron, hinders ore from easily growing clammy or turning into large lumps, or entirely melting. When the ore is sufficiently Walker, let it cool, beat it to powder, and repeat the roasting to a third fire, till when it is red-hot in the fire, there is no smell of sulphur; then mix the ore with fix centners of the black flux, and two of sandvler, and finish the work in the common way, only making the fire greater, and continuing it longer, toward the end of the operation. Cramer's Art of Affaying, p. 292. See Lead Ores.

Pyrites is applied by some authors to the marasite ores of all metals; the names of which are varied according to the metals they partake of.

Thus chalcopyrites is that of gold; argentites that of silver; siderites that of iron; chalcites that of copper; and molybdenites that of lead, &c.

PYRITICUM LIQUAMEN. See Liquamen Pyriticum. PYRITRICHIPHYLLUM, in Natural History, the name of a genus of foliils of the clads of the pyrites, the characters of which are thse: they are compound, inflammable, metallic bodies, found in loose malls not of any regularly angular figure, and of a fritellated texture, with foliaceous ends to the frize, appearing on the surface, or within the mals.

Of this genus there are only two known species: the having the foliaceous ends of the frize on the outer surface of the mals; and the other having a smooth external surface, and the foliaceous ends of the frize covering the sides of internal hollows.

The friz of these is found in many of the English and German mals; the other has been yet only found in the mals on Mendip hills in Somersetshire, but there in considerable plenty. Hill.

PYRITRICUM, the name of a genus of pyrites, the characters of which are these: they are compound, inflammable, metallic foliils, always found in detached mals of K 2
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no regularly angular figure, and of a simply fruticated internal structure.

Of this genus of pyrite there are three known species. All the three species are found plentifully in different parts of the kingdom: the first in all sorts of strata, and often loose on the ground; the second principally in the chalk-pits of Kent and Sussex; and the last in Essex and Hampshire, and very frequently in the German mines. Hill.

PYRITZ, in Geography. See PURITZ.

PYRMONT, a town of Germany, and capital of the county so named; its citadel is fortified with a broad ditch, high ramparts, and subterranean passages and vaults; 12 miles S.W. of Hamala. N. lat. 51° 57’. E. long. 9° 17’.—Alto, a county and principality of Germany, bounded on the N. by the principality of Calenberg, on the E. by Wolfenbuttel and Calenberg, on the S. by Wolfenbuttel, and on the W. by the county of Lippe; about nine miles long, and three broad. The revenues are estimated at 90,000 rix-dollars, principally arising from the springs and falt-works.

PYRMONT Water, in Physiology and Medicine, a very brisk, spirituous chalybeate, abounding in fixed air, and which, when taken up from the fountain at Pyrmont, in Germany, whence its name, sparkles like the brisket Champagne wine. It has a pleasant, vinous taint, and somewhat fulphyreous smell. It is perfectly clear, and bears carriage better than the Spa water.

The history of these waters is accurately given by Hoffman in his observations on them, both in their natural state, and in mixture with other bodies.

He first observes, that they contain a volatile and subtilt principle, much more penetrating and strong, as well as in larger quantity, than any other mineral water; but that this is not to be expected in them any where but upon the spot, for those who transport them to other places are constrained to let a part of this fly off, to preserve the rest.

If either glas or earthen vessels be filled at the spring, and immediately corked and fastened down, the consequence is, that they will burst on the first motion, or heat of the weather. They are, therefore, forced to fill them only in part at first, and let them stand awhile for this subtilt spirit to exhale; and then awhile after the filling them up, to cork and fit them for carriage.

2. If they are drank upon the spot in a morning, on an empty stomach, they affect the nose with a pungent tingling, and disturb the head for many hours afterwards.

3. If they are taken at the spring, they purge but very little; but if taken in another place, after transportation, they purge considerably more, and render the stools black. It is observable also, that if they are left in an open vessel a few days, their virtue wholly exhausts, and they no longer purge nor render the stools black.

4. If tea-leaves, bawdiyne-flowers, or galls, are put into this water, they first change it to a blue, from that to a purple, and finally to a black. This is a ready proof that black is only a deep purple, and purple only a deep blue: a little spirit of vitriol added to this liquor destroys all the colour, and renders it limpid as before.

5. If any acid be mixed with Pyrmont water, there is raised an effervescence, and bubbles of air are carried up in great quantity; and this whether the stronger acids, such as spirit of vitriol, or aqua fortis, be used; or the weaker, as vinegar, lemon juice, or Rhumif wine.

6. If an alkaline liquor be added, whether it be volatile, as the spirit of ful ammoniac, or fixed, as the oil of tartar, there is no ebullition raised, but the liquor becomes turbid and milky. If spirit of vitriol be afterwards added to this, to saturate the additional alkali, the liquor becomes limpid again.

7. Cow’s milk mixed in equal quantity with Pyrmont water does not coagulate, but, on the contrary, becomes thinner than before, and is preserved from turning four f0 soon as it otherwise would in hot weather. This is a proof that there is no predominating acid in these waters.

8. If syrup of violets be added to Pyrmont water, it turns it to a beautiful green. This is a proof of the alkaline nature of these waters; and it is further proved, by adding spirit of vitriol, or any other acid, to this green liquor, which on that becomes limpid again.

9. Four pints of this water evaporated over a gentle fire, yield no more than two scruples of a dry residiuim. Oil of vitriol being poured on this, an acid effervescence arises, and with it an acid and pungent vapour, like that produced by mixing oil of vitriol and common salt. If spirit of vitriol be used instead of the oil, the effervescence is in a less degree, and the salt is in part changed to a bitter saline mass, the remainder separated from which proves to be a calcareous earth, no longer fermenting with the spirit of vitriol.

If a quantity of Pyrmont water be exposed twenty-four hours to the open air in a bason, it will at the end be found to have lost all its virtues, tainting wholly infipid, and being turbid, instead of the fine clearness it had before, and a yellow ochreous earth is precipitated to the bottom: after this the liquor will no longer shew any of those qualities, which were before its distinguihing characters; it will no longer ferment with acids, nor turn black with galls, nor green with syrup of violets.

It appears from the whole, that the Pyrmont waters possess a pure, extremely penetrating, and efficacious mineral spirit, and that in a very large proportion; and to this their virtues are principally to be attributed. This mineral spirit, while it remains engaged in a calcareous earth, imitates the properties of an alkaline substance; and when joined with a subtilt martial earth, it emulates the properties of vitriol, giving the foals a black colour, and turning a tincture of galls into ink: and while this remains in the water in these forms of an alkaline or vitriolic principle of so great subtilty, it cannot but give them very great virtues in strengthening the tone of the visera, opening obstructions, and stimulating in a proper manner the excretory ducts, so as to make them duly perform their office; but as soon as by the standing of the water, or by any other accident, this subtilt element is evaporated, all the virtues of the water must be gone with it.

The great quantity of this powerful spirit contained in the waters, makes them more fit for the robust and strong constitutions, when depraved by illness, than for the weak and tender ones; but even the tenderest people may take them, only observing to take but a small dose, or to dilute them with an equal quantity of common water immediately before the taking them.

Hoffmann also recommends the Pyrmont water mixed with equal quantities of milk, on his own experience, in feverbrite and gouty cafes. Hoffmann, Oper. tom. v. p. 143, foq.

We have already observed, under the articles Acide and Carbonic Acid, that Pyrmont water, and other mineral waters of a similar nature, owe their acidulous taste and peculiar virtues to the fixed Air (carbonic acid) which they contain; and to these articles the reader is referred for a brief histor
of this important discovery. We shall here add some farther remarks on the effects and medical uses of this water.

Persons who drink it at the well are affected with a kind of giddiness or intoxication, which is probably owing to the great quantity of carbonic acid with which the water abounds. The common operation of this water is by urine; but it is also a gentle fudoric, and if taken in large quantity, proves laxative. However, in order to this effect, it is usual to mix some salts with the first glasses. It is drank by glassfuls in the morning, to the quantity of from one to five or six pints, according to circumstances; those who drink it walking about between each glass. This water is recommended in cafes where the constitution is relaxed; in want of appetite and digestion; weaknesses of the stomach, and heartburn; the green sickness; female obstructions and barrenness; the scurvy; and cutaneous diseases; and in the gout, especially, as Hoffmann observes, when mixed with milk; in colics; bloody fluxes; disorders of the breast and lungs; in which case it is best taken lukewarm; in nervous, hysteric, and hystereomalacic disorders; in apoplexies and palsy; in the gravel and urinary obstructions; in foulness of the blood; and in obstructions of the finer vessels. It amends the lax tenure of the blood; exhilarates the spirits without inflaming, as vinous liquors are apt to do; and is reckoned among the best restoratives in decayed and broken constitutions. It is said to provoke the general virtues of the Spa water, and at the fountain it is more spirituous, as well as a stronger chalybeate. Elliot's Medicinal Virtues, &c. of Mineral Waters, 1781, p. 181.

Near the famous well at Pyrmont is a stone quarry under ground, from some parts in which a sulphureous steam comes out, which commonly rises to a small height. Animals held in this steam are soon suffocated, but recover, if quickly taken out. When a man stands in this steam, but with his head over it, it proves an excellent fudoric. Dr. Scipproposes to perform cures in several diseases with it. See Phil. Trans. No. 448, sect. 4, and Misc. Berolin. tom. v. part 2. sect. 4. See Grotta del Serpi.

Pyrmont Water, Imitation of. This medicinal water may be imitated very nicely by art in the following manner: take a quart of the purest and lightest water, add to it thirty drops of a strong solution of iron made in spirit of salt, a drachm of oil of tartar per diluent, and thirty drops of spirit of vitriol, or a little more or less, as is found necessary, not to let the alkali of the oil of tartar prevail too strongly, though it must prevail a little. Shake all briskly together, and on tasting it will be found extremely to resemble the true Pyrmont water.

The basis of which this is founded is the analysis and trial of the true Pyrmont water, by which it is found to contain a subtle aqueous fluid, a volatile iron, and a predominant alkali, all joined together into one brilky pungent spirituous water. The artificial Pyrmont thus made, if the proportions are carefully mind'd, will extremely resemble the natural, and will have the same effect as a medicine. Shaw's Lectures, p. 96.

But the best method of forming artificial Pyrmont water is by impregnating it with fixed air, or carbonic acid, for which we are indebted to Dr. Priestley. The first paper, we believe, which actually compounded an artificial spirituous or spirituous water, like that of Belzachu or Pyrmont, was M. Venel; though he was ignorant of the real nature of the ingredient to which it owed these qualities, and which he erroneously supposed to be common air. For this purpose he diffused in a pint of water two draughts of folile alkali, to which he added an equal quantity of marine acid: in the process he made use of a vessel with a narrow neck, and to prevent the escape of the air, he disposed the ingredients in such a manner, that they could not communicate with each other till after the bottle was corked. In this case the fixed air diffused from the alkaline salt, in a phial nearly full and closely corked, being confined, suffers a degree of compression that greatly promotes its combination with the water. See Mémories présentés par les Savans Etrangers, tom. ii. containing two Memoirs of M. Venel, read before the Royal Academy of Sciences in 1750; and Lawiolier's Élens, &c. by him, p. 34, &c. However, Dr. Priestley was undoubtedly the first who to far improved upon the discoveries made by himself and others in relation to the principle then denominated fixed air, as to contrive an easy method of impregnating water with it. The first idea of this kind occurred to him in 1757, when, having placed shallow vessels of water within the region of fixed air on the surface of the fermenting vessels of a brewery, and left them all night in that situation, he found that the water had acquired a very feemeable and pleasant impregnation. He proceeded to accelerate the impregnation by pouring the water from one vessel into another, while they were both held within the sphere of the fixed air. The method of effecting this by air diffused from chalk and other calcareous substances, did not occur to him till the year 1772, when he published his directions for this purpose, together with a drawing of the necessary apparatus, which he had before communicated to the Board of Admiralty. This apparatus, represented in Plate XV. Pneumatics, fig. 1, consists of a glass vessel, a, with a narrow neck, and fo formed, that it will stand upright, with its mouth downwards: this vessel, when filled with water, and covered with a slip of paper or thin pasteboard, prefixed close to it, to prevent the admittance of common air, is inverted in another vessel, b, with a little water in it, so that the slip of paper or pasteboard may be withdrawn, and the end of the pipe, c, introduced into it. This pipe is flexible and air-tight, and bell made of leather, sewed with a shoemaker's waxed thread. It is kept open at both ends by a piece of a quill, while one of them is introduced into the vessel of water, and the other into the bladder d; the opposite end of which is tied round a perforated cork, kept open by a quill, and the cork is made to fit a phial, e, two-thirds of which should be filled with chalk just covered with water. Dr. Priestley has since found it most convenient to use a glass tube; and to prefer the advantage which he had of agitating the vessel e, he makes use of two bladders, communicating by a perforated cork, to which they are both tied. He also observes, that the flexible pipe is not necessary; but indeed of this a bent tube of glass must be ready to be inserted into the hole made in the cork, when the bladder containing the fixed air is separated from the phial in which it was generated. The extremity of this tube being put under the vessel of water, and the bladder being compressed, the air will be conveyed into it, as in the other case. Instead of the bladder, a small phial may be inserted between the phial containing the chalk, &c. and the vessel of water for thus the chalk and water that may be thrown up into the tube communicating with this phial will lodge at the bottom of the other, while nothing but the air will get into the pipe communicating with the water. The apparatus being thus prepared, let the phial containing the chalk and water be detached from the bladder, and the pipe also from the vessel of water; pour a little oil of vitriol upon the chalk and water; and having carefully press'd all the common air out of the bladder, put the cork into the bottle presently after the effervescence has begun. Also press the bladder once more after a little of the newly-generated air has got into it, in order the more effectually to clear it of all the remains of the common air; and then introduce
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Introduce the end of the pipe into the mouth of the vessel of water, as in the drawing, and begin to agitate the chalk and water briskly. This will presently produce a considerable quantity of fixed air, which will distend the bladder; and this being pressed, the air will force its way through the pipe, and ascend into the vessel of water, the water at the same time descending, and coming into the basin.

When about one-half of the water is forced out, let the operator lay his hand upon the uppermost part of the vessel, and shake it as briskly as he can, not to throw the water out of the basin; and in a few minutes the water will absorb the air, and taking its place, will nearly fill the vessel as at the first. Then shake the phial containing the chalk and water again, and force more air into the vessel, till, upon the whole, about an equal bulk of air has been thrown into it. Also shake the water as before, till no more of the air can be imbibed. As soon as this is perceived to be the case, the water is ready for use; and if it be not used immediately, should be put into a bottle as soon as possible, well corked, and cemented. It will keep, however, very well, if the bottle be only well corked, and kept with the mouth downwards.

It may be proper to observe on this process, that the phial, \( \text{a} \), should always be placed considerably lower than the vessel \( \text{a} \); that the water to which the chalk is put should be changed after every operation; that with a vessel of water holding three pints, and a phial containing the chalk and water of ten ounces, a little more than a teacupful of oil of vitriol will produce air enough to impregnate such a quantity of water, that the whole processes does not take up more than a quarter of an hour, and the agitation not five minutes; and that in this method the water is easily made to imbibe an equal bulk of air; whereas Dr. Browarigg found that Pyrmont water at the spring-head did not contain so much as one-half. This apparatus has received considerable improvements, which we shall briefly recite; but in justice to the merit of the original inventor, his method deserves to be recorded; and besides, it requires less time, and is much less expensive than those that are now generally used.

The apparatus contrived by Mr. Nook, and improved by Mr. Parker, is represented in fig. 2. It is made of glass, and stands on a wooden vessel, \( \text{d} \), resembling a tea-board; the middle vessel \( \text{B} \) has a neck, which is inserted into the mouth of the vessel \( \text{A} \), to which it is ground-air-tight. This lower neck of the vessel \( \text{B} \) has a glass stopper \( \text{S} \), composed of two parts, both having holes sufficient to let a good quantity of air pass through them. Between these two parts is left a small space, containing a plano-convex lens, which acts like a valve, in letting the air pass from below upwardly, and hindering its return into the vessel \( \text{A} \). The upper vessel \( \text{C} \) terminates below in a tube \( \text{r} \), which, being crooked, hinders the immediate ascent to the bubbles of fixed air into that vessel, before they reach the surface of the water in the vessel \( \text{B} \). The vessel \( \text{C} \) is also ground-air-tight to the upper neck of the middle vessel \( \text{B} \), and has a stopper \( \text{p} \), fitted to its upper mouth, which has a hole through its middle. The upper vessel \( \text{B} \) holds just half as much as the middle one \( \text{B} \); and the end, \( \text{t} \), of the crooked tube goes no lower than the middle of the vessel \( \text{B} \).

For the use of this apparatus, fill the middle vessel \( \text{B} \) with spring or any other wholesome water, and join to it the vessel \( \text{C} \). Pour water into the vessel \( \text{A} \) (by the opening \( \text{m} \), or otherwise) so as to cover the rising part of its bottom: about three-fourths of a pint will be sufficient. Fill an ounce phial with oil of vitriol, and add it to the water, shaking the vessel so as to mix them well together. As heat is generated, it will be best to add the oil by a little at a time; otherwise the vessel may be broke. Put to this, through a wide glass or paper funnel, about an ounce of powdered raw chalk, or marble. White marble being first granulated, or pounded like coarse sand, is better for the purpose than pounded chalk, because it is harder; and, therefore, the action of the diluted acid upon it is slower, and lasts a considerable time. On this account the supply of fixed air from it is more regular than with the chalk; and besides, when no more air is produced, the water may be decanted from the vessel \( \text{A} \), and the white sediment washed off, and the remaining granulated marble may be employed again, by adding to it fresh water and a new quantity of oil of vitriol. The funnel in this process is made use of in order to prevent the powder from touching the inside of the vessel's mouth; for if it happens, it will stick so strongly to the neck of the vessel \( \text{B} \), as not to admit of their being separated without breaking. Place immediately the two vessels \( \text{B} \) and \( \text{C} \) (fastened to each other) into the mouth of the vessel \( \text{A} \), as in the figure, and all the fixed air which is diffengaged from the chalk or marble by the oil of vitriol, will pass up through the valve \( \text{S} \) into this vessel \( \text{B} \). When this fixed air comes to the top of the vessel \( \text{B} \), it will dislodge from thence as much water as is equal to its bulk; which water will be forced up through the crooked tube into the upper vessel \( \text{C} \).

Care must be taken not to shake the vessel \( \text{A} \) when the powdered chalk is put in; otherwise a great and sudden effervescence will enflue, which will perhaps expel part of the contents. In such case it may be necessary to open a little the flappor \( \text{p} \), in order to give vent, otherwise the vessel \( \text{A} \) may burst. It will be proper also to throw away the contents, and wash the vessel; for the matter will stick between the necks of the vessels, and cement them together. The operation must then be begun anew. But if the chalk be thrown in without shaking the machine, or if marble be used, the effervescence will not be violent. If the chalk be put into the vessel loosely wrapped in paper, this accident will be still better guarded against. When the effervescence goes on well, the vessel \( \text{C} \) will soon be filled with water, and the vessel \( \text{B} \) half filled with air; which will easily be known to the eye, by the air going up in large bubbles through the crooked tube \( \text{r} \).

When this is observed, take off the two vessels \( \text{B} \) and \( \text{C} \) together as they are, and shake them so that the water and air within them may be much agitated. A great part of the fixed air will be absorbed into the water; as will appear by the end of the crooked tube being considerably under the surface of the water in the vessel. The shaking them for two or three minutes will be sufficient for this purpose. These vessels must not be shook while joined to the under one \( \text{A} \), otherwise too great an effervescence will be occasioned in the litter; together with the ill consequences above-mentioned. After the water and air have been sufficiently agitated, loose the upper vessel \( \text{C} \), so that the remaining water may fall down into \( \text{B} \), and the unabsoved air pass out. Put these vessels together, and replace them into the mouth of \( \text{A} \), in order that \( \text{B} \) may be again half filled with fixed air. Shake the vessels \( \text{B} \) and \( \text{C} \), and let out the unabsoved air as before. By repeating the operation three or four times, the water will be sufficiently impregnated.

Whenever the effervescence nearly ceases in the vessel \( \text{A} \), it may be renewed by giving it a gentle shake, so that the powdered chalk or marble at the bottom may be mixed with the oil of vitriol and water above it; for then a greater quantity of fixed air will be disgorged. When the effervescence can be no longer renewed by shaking the vessel \( \text{A} \), other more chalk must be put in, or more...
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more oil of vitriol; or more water, if neither of these produce the desired effects.

The ingenious Mr. Magellan has still farther improved the contrivance of Dr. Nootch and Mr. Parker; he has two sets of the vessels B and C. While he is shaking the air and water contained in one of these sets, the other may be receiving fixed air from the vessel A. By this means twice the quantity of water may be impregnated in the same time. He has a wooden stand K (fig. 3.) to fix the vessels B, C, &c., when taken off from A, which is very convenient. He has a small tin trough for measuring the quantity of chalk or marble requisite for one operation, and a wide glass funnel for putting it through into the vessel A, to prevent its sticking to the sides, as mentioned before.

He has also contrived a stopple without a hole, to be used occasionally, instead of the perforated one p. It has a kind of baffle at the top, to hold an additional weight when necessary. (See fig. 4.) The stopple must be of a conical figure, and very loose; but so exactly and smoothly ground as to be air-tight merely by its pressure, which may be increased by additional weights put into its baffle. Its use is to compress the fixed air on the water, and thereby increase the impregnation; for by keeping the air on the water in this compressed state, the latter may be made to sparkle like Champaign. And if the vessels are strong, there will be no danger of their bursting in the operation.

If the vessels be suffered to stand six or eight hours, the water will be sufficiently impregnated even without agitation. But by employing the means above described, it may be done in as many minutes.

The water thus impregnated may be drawn out at the opening A. But if it is not wanted immediately, it will be better to let it remain in the machine, where it has no communication with the external air. Otherwise the fixed air flies off by degrees, and the water becomes vapid and flat; as also happens to other acidulous waters. But it may be kept a long time in bottles well stopped, especially if they are placed with their mouths downwards.

Mr. Blades of Ludgate-Hill has still farther improved this apparatus, by changing the stopple at k for a glass cock, which is more convenient. He has likewise altered the middle vessel B into a form more advantageous for the impregnation. See fig. 5.

For Dr. Hulme’s method of impregnating water with fixed air, we refer to his “Safe and easy Remedy for the Stone;” &c. 1778: observing, that he merely mixes the solution of fixed alkaline salt and water, containing as much vitriolic acid as he finds necessary, a priori, for neutralizing the alkali, and expelling from it all its fixed air.

Dr. Withering, of Birmingham, has lately contrived a new apparatus for impregnating water with fixed air, which, he says, is preferable to that in common use, because it can be made at less expense, and is more easily prepared; because the whole quantity of fixed air produced is converted to use, without any waste of the vitriolic acid; because it impregnates three times the quantity of water at one time, more completely and with less trouble; and the impregnated water will always retain its virtue, if the joints and cocks of the machine are made perfectly air-tight; for which purpose they should once a year be supplied with a full quantity of unaltered lard. This apparatus is exhibited in fig. 6, and consists of a glass vessel A, about ten inches high in the cylindrical part, and six inches and a half in diameter; another glass vessel B, about twelve inches high in the conical part, one inch and a half in the neck, and five inches in diameter at the bottom; a copper pipe C passing through the stopple of the vessel B, and tied fast in the flexible tube D, made of strong leather, air-tight, and kept hollow by means of a spiral wire passing through its whole length; a conical brass pipe E, with a stopple fastened to the tube D; another conical pipe F, with a stopple G, into which the end of the tube E is accurately ground, so as to be air-tight, and cutting off all communication with the atmosphere when the pipe E is removed; two large hog’s bladders H, H, each of which ought to hold two quarts; a stopple I, to prevent the water entering into the bladders, when the vessel A is agitated; a bladder K, tied to the crooked tube with the stopple L, which occasionally opens or shuts the communication with the vessel B; a glass funnel M, accurately fitted with the glass stopper N; an aperture O, fitted with a glass stopper or a silver cock, from which the impregnated water is to be drawn for use; and, lastly, the tube P opening into the vessel A. When this apparatus is used, let the vessel A be filled with pure water, and any other ingredients that are required, in a proper proportion; into the vessel B put as much marble or whiting, in small lumps, as will cover its bottom to the height of about two inches, and pour in water to the height represented by the dotted line; let the mouth of the vessel A be well fitted with a cork, and through a hole in the cork pass the tube P, putting upon the cork melted sealing-wax of the softest kind, or modelling-wax, so as to make the whole air-tight. The modelling-wax may be procured at the engravers, or it may be prepared by adding to half a pound of melted bees-wax, two ounces of tallow, and one ounce of Venice turpentine; to this mix add a sufficient quantity of red lead, or Spanish brown, to give it a colour, and let the mixture be fired till it is cold; let the mouth of the vessel B be stopped with a piece of mahogany, turned into a conical figure in a lathe, and of a size somewhat larger than the mouth of the glasses will admit; put this piece of wood into melted bees-wax, and heat the wax till the wood begins to grow black; when cool, turn it again till it fits the mouth of the vessel; the tubes C, L, and M, are fitted into holes bored through the wooden stopper, previous to its being immered in the wax; push these tubes through the holes, and press the stopper into the orifice of the vessel B, and cement the whole with sealing- or modelling-wax; shut the stopcocks I and L, having previously pressed the air out of the bladder K; open the stop-cocks G and E; then squeeze the air out of the bladders H, H, and afterwards press the conical pipe E into the pipe F; pour about a large spoonful of oil of vitriolic through the funnel M, and stop it with its stopper N. The fixable air let loose by the effervescence in the vessel B, rising through the tube C, paffes into the bladders H, H, and diffuses it. In this case open the stop-cock I, and from the aperture O draw out about a quart of water; and the space before occupied by the water will be filled with fixable air, which soon begins to be absorbed by the remaining water, and is still supplied from the bladders H, H, and from the effervescence mixture in the vessel B. When the bladders are considerably collapsed, more vitriolic acid must be added through the funnel M, so that they may be always kept pretty fully diffused. When an impregnation is speedily required, turn the stop-cocks at G and E, and open that at L; then separate the pipe E from the tube F, and agitate the vessel A; the fixable air will pass into the bladder K, and may be pressed into the two other bladders, when the parts of the apparatus are united. During the agitation, the stop-cock at I should be closed, and open only occasionally to supply out of the bladders H, H, the fixable air absorbed by the water. If a strong impregnation be required, this process should be carried on in a room, the heat of which does not exceed forty-eight degrees of Fahrenheit’s thermometer. Dr. Withering observes,
observes, that the impregnated water receives no taint from the bladders: and that if the vessel A with its impregnated water be separated from the vessel B, at the conical parting E F, it may be inclosed in a pyramidal mahogany case, out of the lower part of which the silver cock at O projects; and thus serve for an ornamental as well as a luxurious and fabulous addition to the side-board, particularly in the summer and autumnal feasts.

Mr. Henry has described a method of impregnating water in large quantities with fixed air, so as to give it the properties of mineral water, for the use of the sick on board of ships, and in hospitals. He has given the following account of his apparatus and proceeds for this purpose. Cut off the two extremities of a calf’s or pig’s bladder (Figs. 7.) and having previously moistened them, into one end insert the top of the tubular stopper e, round the neck of which it is to be closely fastened with strong thread. Into the upper end introduce the part g of the long bent tube h, and tie them round in the same manner. The pipe k must be passed through a hole formed by a hot iron hourer, in a large barrel adapted to the orifice i in the cask B B, holding about ten or twelve gallons, to which it must be cemented: and the length of the pipe from this point must be such as to reach within a few inches of the bottom of the cask B B, which is to be completely filled with fresh water, or such as has been recovered from lime. See Putrefaction of Water.

To a quantity of mild calcareous earth and water, placed in the air-vessel C, add a small portion of strong vitriolic acid, and by the time most of the common air may be supposed to be expelled by the fixed air arising from the mild calcareous earth, add a larger quantity of acid, and putting the tubulated stopper e in its place, the bladder f will become inflated. Puts it gently till its sides collapse: and then introducing the pipe k h, with its cork, into the orifice f of the cask B B, again press the air forward, as it diffuses the bladder into the water cask, where, bubbling up through the water, it will rise to the surface, and by its prelure, force the water to ascend into the funnel l, which is to be cemented into the head of the cask at l. In proportion as the water in the cask becomes impregnated with fixed air, that in the funnel will return into its place; but if, at any time, the latter should rise so high as to be in danger of overflowing, a quantity of air may be let out of the water cask, by means of the small plug m. And this is necessary to be done, occasionally, to discharge the residuum of the fixed air, which is not soluble in water.

If the operation be required to be performed more expeditiously, it may be quickened by agitating the water cask. To do this, the tubular stopper e must be withdrawn from the air-vessel, and supported, together with the bladder, by an attendant, while the cask B B is shaken. During this time another tubular stopper must be put into the air-vessel, and it may be immersed into a quantity of lime-water to prevent waste. When the agitation has been continued for some minutes, in proportion to the falling of the water in the funnel, replace the stopper attached to the bladder f in the air-vessel when taken out of the lime-water, and proceed as before, repeating the agitation occasionally.

During the process, additional quantities of vitriolic acid may be introduced into the air-vessel through the opening at d, which is to be, at all other times, carefully secured with its stopper.

By this process, fixed air may be imparted to wine, beer, and almost any liquor whatever. And when beer is become flat or dead, it will be revived by this means; but the delicate agreeable flavour, or acidulous taint communicated by the fixed air, and which is manifest in water, will hardly be perceived in wine, or other liquors, which have much taint of their own.

The artificial mineral waters thus made, are more pleasant to the taste than the natural Pyrmont or Seltzer waters; which, besides their fixed air, contain saline particles of a disagreeable taint, which are known to contribute little or nothing to their medicinal virtues, and may be found in some cafes, hurtful. They are likewise confusably stronger. According to Sir John Pringle, these waters may be made more nearly to resemble genuine Pyrmont water, by adding to each pint of them from eight to ten drops of tinctura martis cum spiritu fals. Or this may be done, by adding to the water in the middle vessel B (fig. 2.) in the proportion of about thirty grains of Epsom salt, ten grains of common salt, a scruple of magnesia alba, and a drachm of iron filings, or iron wire, clean and free from rust, to one gallon of spring water, and impregnating the whole with fixed air in the manner already described. Let them remain till the other ingredients, and as much of the iron as is necessary, are dissolved, which will be in two or three days; or the magnesia may be omitted, and then the operation will be finished in less than half that time. These waters may be rendered ferruginous or chalybeate very easily, by putting in the middle vessel two or more smaller phials, filled with cuttings of fine iron-binding wire, or with small iron nails; because the impregnated water will dissolve the iron so fast, as to become well saturated with it in a few hours, according to the experiments of Mr. Lane. But the method of rendering these artificial waters chalybeate, used by Dr. Hulme, is to add one grain of salt of steel to each pint (sixteen ounces) of water already impregnated with fixed air.

The discovery of an easy method of impregnating water with fixed air is of great importance; as it is now well known that such water is a very powerful antiseptic, and that it both refines and corrects putrefaction. It is, therefore, given with great success in putrid fevers, in the febricary, in dysenteries, in mortifications, and in other disorders arising from a putrid cause, or attended with putrefaction, a draught of it being taken now and then, or even by way of common drink. But the ingenious Mr. Bewley has invented a still better method of exhibiting fixed air as a medicine. He directs a scruple of alkaline salt to be dissolved in a sufficient quantity (a quarter of a pint, or less) of water, which is to be impregnated with as much fixed air as it can imbibe; this is to be drank for one dose. Mr. Bewley directs it to be prepared in larger quantities at a time, and calls it his mephitic julep. If immediately after it a spoonful of lemon juice, mixed with two or three spoonsful of water, and sweetened with sugar, be drank, the fixed air will be extracted in the stomach; and thus a much greater quantity of it may be given than the same quantity of water alone can be made to imbibe. Fixed air acts as a corrodant; and, therefore, may be given with success in weaknesses of the stomach, and in vomitings arising from that cause. It has also been given with success in fevers in the lungs, and in nephritic complaints. When the lungs are purulent, fixed air, mixed with the air drawn into the lungs, has repeatedly been found to perform a cure. The bark also may be given with advantage in water impregnated with fixed air, as they both coincide in the same intention. Fixed air may be applied by means of a syringe, funnel, or otherwise, to inflamed breasts, putrid ulcers, mortified parts, ulcerated throat, and has been found in such and similar cases to have very remarkable efficacy. It may also be given internally at the same time. In putrid dysenteries, and in putrid ulcers, fixed air may be given by way of clyster.

Ferment-
Fermenting cataplans are of service chiefly as they supply fixed air to the part. In cases of putridity, fixed air has been successfully applied to the surface of the body, exposed to streams of it. It is also found an excellent cooling as well as strengthening beverage in hot relaxing weather, and has the advantage of being pleasant to the taste. See on the subject of this article PrieiJley's Exp. and Obs. on Air, vol. ii. p. 263, &c. 298, &c. Phil. Trans. vol. 17v. part i. p. 59, &c. Magellan's Description of a Glass Apparatus for making Mineral Waters, &c. p. i. &c. PrieiJley's Exp. and Obs. vol. v. Appendix, p. 389, &c. Eliott's Account of the Nature and medicinal Virtues of the principal Mineral Waters, &c. 1781. Henry's Account of a Method of preserving Water at Sea, &c. 1781. p. 19, &c.

PYROBOLOGY, or the art of missile fires, is derived from the Greek πυρ, fire, and τόξον, to throw. See Pyrotechny.

PYROBOLUS, in Natural History, a name given by many authors to the flower more generally called pyrites; others have called it siderites, pyroxanthes, pyropolus, and othomana, and the Greeks mylais.

PYROCHROA, in Entomology. See Lampyris.

PYROCTOGONIUM, in Natural History, the name given by Dr. Hill to a genus of fossils usually comprehended by authors, with many other bodies of a different figure and structure, under the general name pyrites.

The character of the pyroctogonium are these: it is a compound, inflammable, metallic body, of a regular octahedral figure, or composed of eight planes.

There is only one known species of this genus, which is a very singular and elegant foil, being composed of eight triangular planes; these being the sides of two quadrilateral pyramids, with broad bases, which being joined base to base, constitute the pyroctogonium.

It is found very frequently in Cornwall, Devonshire, and moft other of our counties where there are mines. It is sometimes met with loose in the earth, sometimes lodged in the bodies of maratists, or in the fold fossils, and varies sometimes from its iron colour to a dusky yellow. It is sometimes also found with many speeimens connected into a mass; these are seldom uniform in size, and coherent in various directions, often greatly injuring one another's figure. Sometimes also, as in the case of the cryftals, they form a large mass, of which the outer surface only is concreted into or covered with regular figures, the whole inner part being a confued fulbstance.

Metals of this kind are not unfrequently found of a regular orbicular figure, and befet all over with regularly figured pyroctogonia of various sizes. Hill.

PYROMALITITE, in Mineralogy, a mineral discovered some years ago in the mine of Bjelke, in Vemeland, a province of Sweden, situated on the N. side of the lake Venner, which was observed to have the property of giving out the odour of muriatic acid when heated, and hence distinguished by the name of pyromalite. J. G. Gahn of Fahlin has given the following description of it. Its colour is commonly yellow-brown, paling into greenish: internally, it is light greenish-yellow. It occurs crystallized in regular fix-sided prisms, without any terminating pyramids. It is composed of plates lying on each other in a direction perpendicular to the axis of the prism; principal fracture, repidant; cross fracture, uneven and without lustre; opaque; semi-hard; scratched with fleec: the cryftals are often several inches long; specific gravity 3.081. Before the blowpipe it becomes dark reddish-brown, and emits the odour of muriatic acid. It then melts into a black flag, and at last a small bead is obtained, more or less attracted by the magnet. It dissolves readily, and in considerable quantity in glass of borax, and gives a colour indicating the presence of muriatic and iron:—in phosphate of ammonia and soda it dissolves with great difficulty. Its constituents are silica, lime, iron, muriate, and muriatic acid. In the mine of Bjelke it occurs mixed with iron ore, calcareous spar, and black crytallized malaolite. Pyromalite was lately analysed by Mr. Hifinger, who found its constituents to be as follows:

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>35.4</td>
</tr>
<tr>
<td>Oxid of iron</td>
<td>32.6</td>
</tr>
<tr>
<td>Oxid of muriate</td>
<td>23.1</td>
</tr>
<tr>
<td>Alumina</td>
<td>0.6</td>
</tr>
<tr>
<td>Muriate acid</td>
<td>6.5</td>
</tr>
<tr>
<td>Lofs</td>
<td>1.8</td>
</tr>
</tbody>
</table>

The escape of the acid by heat seems to indicate the presence of a portion of water amounting to about two-thirds of the lobs stated as contained in the analysis. Annals of Philosophy, No. 12.

PYROGENUS, formed of πυρ, fire, and γενειο, name, is a term sometimes used for rectified spirit of wine; thus called because made by fire, or rather because rendered of a fiery nature.

PYROET, PYROEUT, or rather Pirouette, in the Manager. See Pirouette.


Gen. Ch. Cal. Periand inferior, small, in five deep segments, permanent. Cor. Petals five, roundish, concave, spreading. Stam. Filaments ten, awl-shaped, shorter than the corolla; anthers drooping, large, with two horns at the base, each discharging the pollen by a terminal orifice. Pf. Germin superior, roundish, angular; stylo cylindrical, permanent, various in length and direction, sometimes scarcely any; stigma thickish, variously shaped. Peric. Capsule roundish, deprived, five-sided, of five cells, burling at the angles. Seeds numerous, chilly.

Eff. Ch. Calyx five in deep segments. Petals five. Capule superior, five cells, burling at the angles, and many seeds. Anthers with two pores.

Obf. In some species the ilaments and stylo are erect; in others inclined to one side or the other; in some the former spread every way. The form of the stigma is different in different species. In two American ones the stigma is nearly, or quite, fesse. On which mark Mr. Pursh's genus Chimaphila is founded, its name being nearly synonymous with Winter-green, the English appellation of Pyrola.

Section 1. Style elongated. Pyrola of Pursh.

part in mountainous situations, in the more northern parts of Europe, also in North America, flowering in July. We have gathered it on the plain of mount Cenis, and in moir parts of the sandy downs of Holland; opposite to which, on the Norfolk coast, this plant has likewise been found by the accurate Mr. Lily Wigg, growing among bushes, on Bradwell common, not far from Yarmouth: where we likewise have seen it. There is more difficulty in ascertaining an indubitable fixation of this species in the northern or mountainous parts of Britain, because the media having been so much confounded with it, nor have we any specimens from those countries. The roots are perennial, long, creeping, thread-shaped, scaly. Stems very short and simple, leafy, solitary at the end of each shoot of the root. Leaves four or five; on bordered smooth footstalks of various lengths (from one to two inches); roundish or elliptical, obtuse, an inch or inch and a half long, very obscurely crenate, smooth, shining, reticulated with numerous veins; paler beneath. Flower-stalk terminal, solitary, about a span long, angular, slightly twilled, smooth, bearing a few scattered lanceolate membranaceous bracteas, and terminating in a long, rather loose, cluster of four or eight or ten large, handome, white, drooping, but not quite pendulous, fragrant flowers, each having a similar bractea to the reed, at the base of the partial stalk, and fully equal to it in length. Segments of the calyx lanceolate, acute, full half the length of the petals, which, though usually rounded and blunt, have sometimes a pointed appearance. Stamens about the length of the calyx; all turned upward, and crowded together; their anthers deflexed, yellow, with orange horns. Germ short, five-lobed. Style twice as long as the stamens, slender and quite pendulous in its lower part, gradually swelling towards the extremity, which is recurved. Stigma dilated, annular, with five small central points. Capsule the size of a pea, deflexed, five-lobed, crowned with the permanent style and stigma.

2. P. chlorantha. Greenish-flowered Winter-green.—Swartz in Stockh. Trans. for 1816. 190. t. 5. (P. folio obtuso, flor ore viriduscuio; Rivin. Pentap. Irr. t. 136. f. 1.)—Stamens slightly ascending. Style twice as long, club-shaped, deflexed and recurved. Cluster many-flowered. Calyx shorter than the stamens. Native of Sweden, and probably, by the synonym of Rivinus, of Germany, flowering about the middle of July. Professor Swartz distinguishes it from the foregoing, by the smaller, often abrupt, leaves; floral almost indissoluto of bracteas below; petals of a whitish, or yellowish, green hue; and stamens less curved upwards. We gather also, from his figure and description, that the bracteas which accompany each flower are much shorter than the partial stalks, and that the calyx also is shorter, and more close-preted, than in P. rotundifolia.

In the posture and form of the style we find no difference. The common flower-stalk is remarkably spiral. Perhaps the P. folio rotundo of Rivinus, t. 137, may represent this species in fruit; as the posture of the permanent style agrees better with it than with the following.

3. P. media. Intermediate Winter-green. Swartz in Stockh. Trans. for 1814 (not 1794); 257. t. 71. f. 1. Engl. Bot. t. 1945. Winch Guide, v. 2. l. 13. (P. rotundifolia; Linn. t. 110.)—Stamens regularly infixed. Style twice as long, deflexed perpendicularly. Cluster of many pendulous flowers. Calyx shorter than the stamens. Native of bushy shady places in Sweden, and various parts of the north of England, flowering towards the end of June. We suspect also that this is the Oxeldrihice species, commonly mistaken for minor, and that it has often in Scotland, from whence we have specimens, been taken for rotundifolia. The leaves most agree with the last-named, but the flowers differ essentially in being smaller, more pendulous, and of a less pure white. The stamens are nearly twice the length of the calyx, all regularly and equally infixed, not at all turned upward. Style bent in a curve downward, its extremity furrowed, slightly thickened, vertical, not recurved. The floral is spiral, as in the leaf, with about two distinct bracteas in its lower part, the bracteas which accompany each blower being nearly as long as the partial stalks. Even Linneas may perhaps have confounded this with its true minor.

4. P. minor. Lesser Winter-green. Linn. Sp. Pl. 567. Wilds. n. 2. Ait. n. 2. Engl. Bot. t. 158. Fl. Dan. t. 55. Rivin. Pentap. Irr. t. 136. f. 1. (P. rofes; Engl. Bot. t. 2543.)—Stamens regularly infixed. Style the same length, straight, stigma lobed, pointed. Cluster of many drooping flowers. Stalk straight. Native of woods and thickets on the mountains of Europe; occurring in several parts of Scotland and the county of Durham, and flowering in July. This is smaller in general than any of the foregoing; the leaves more elliptical; floral straight, not spiral, with three principal angles and a smaller one, bearing a few broad bracteas near the base, but feebly any other, except the small awl-shaped ones at each partial stalk. The flowers are very numerous, but small, drooping or even pendulous, white with more or less of a pink tinge. Stamens regularly incurved. Pores of the anthers dilated, not tubular. Style of a much shorter proportion than any of those we have hitherto mentioned; the floral large, five-lobed, deflexed, and dequated of points, in the centre. We can no longer doubt that t. 158 and t. 2543 of English Botany represent one and the same species, which we poetics also from mount Cenis, Savoy, and Switzerland, as well as in the Linnean herbarium. P. media, having been confounded by botanists in general with this, has caused all our perplexity expressed in Engl. Bot. 2543. The plant which Mr. Lightfoot introduced at Bullrude, we judge from memory to have been media; see Engl. Bot. 158.

5. P. afarifolia. Afarabacca-leafed Winter-green. Michteas Boreal-Amer. v. 2. 251. Pursh n. 2. “Leaves kidney-shaped. Stalk with a few feathering, convoluted, distant scales. Flowers turned every way. Style declining.” Michteas.—Found by Michaux in Canada; by Pursh in beech woods on the mountains of Pennsylvania, flowering in July. The flowers are yellowish-green. If it were not for the “feathering scales,” we should suspect this might be the same as our chlorantha, n. 2, whose leaves are often, it seems, short and abrupt; but we have no specimens unanswerable to either.

6. P. dentata. Toothed Winter-green. Leaves elliptic-obovate, obtuse, toothed. Stalk straight, obscurely angular, nearly naked. Stamens ascending. Style deflexed, strongly recurved. Stigma with a cylindrical point. Gathered by Mr. Menzies, on the west coast of North America. This species is readily distinguished from all others, hitherto discovered, by its leaves, which are obovate, or somewhat elliptical, one and a half or two inches long, half or three quarters of an inch broad; their margins beget with very remarkable dilisciency, small, blunt teeth, usually near a quarter of an inch; their surface not reticulated, but furnished with one series of connected arching veins, on each side the midrib. Floral-stalks triangular, about as long as the leaves. Floral-stalks fix inches long, nearly naked, round, very slightly angular, bearing a long loose cluster of flowers, much resembling those of the first species in size and structure, as well as in the position of their stamens; but their floral is still more remarkably recurved, so as to form a semi-circle; and the point of the floral much more prominent, of a cylindrical shape, five-cleft at the summit.

7. P. ophylla. Leaffets Winter-green. Stem and floral feely,
fealy, without leaves. Anthers beaked. Style deflexed and recurved. Stigma with a cylindrical point.—Gathered on the west coast of North America, by Mr. Menzies, who affirms the plant is always quite deficite of leaves, instead of which the angular stem bears numerous lanceolate, membranous, pointed scales, about half an inch in length, a few similar but more remote ones being scattered along the flake, which is angular. The flowers are nearly as large as the leaf, but our dried specimen will not allow us to determine the purpore of the flowers. The anthers are long and narrow, with a small acute point at the contrary end to the pores. Style deflexed, its end somewhat recurved. Stigma with a long cylindrical point, like the leaf.

8. P. pita. Variegated Winter-green.—Leaves ovate, somewhat ferrature. Flowers dropping all one way. Pores of the anthers contracted, tubular. Style curved. Stigma abrupt, with five small points.—This also was found by Mr. Menzies on the west coast of North America. In some points it agrees with the two last, as well as with the rotundifolia and its allies; in others it resembles the following, but is a totally different species. The leaves are near an inch and half long, and almost as thick with bluish, more or less dilated, ferrature, rather flabby, marked with large branching veins, and variegated with white or yellowish blotches. Flowers nearly as long as the leaves. Flower-stalk six inches long, obliquely ascending, quadrangular, twisted, bearing two or three short, ovate, pointed scales. Flowers numerous, as big as those of the rotundifolia, all, as far as we can judge from the dried specimen, dropping toward one side. Calyx short, broad, and spreading. Stamen all, as far as can be discerned, alike dispersed round the germin; their anthers short, ovate, minutely pointed, the pores prominent in the form of two short narrow tubes, contracted at the orifice. Style curved, but we cannot tell in what direction. Stigma scarcely at all thicker than the style, abrupt, with an acute edge, and apparently five minute sharp central points.

9. P. secunda. Serrated Winter-green. Linn. Sp. Pl. 567. Willd. n. 3. Ait. n. 3. Pursh n. 4. Fl. Dan. t. 402. Engl. Bot. t. 517. (P. secunda tenerior; Chuf. Hift. v. 2. 117. Ger. Em. 408. P. folio macronato; Rivin. Pentap. Irr. t. 138. f. 2.)—Leaves ovate, acute, ferrature. Flowers drooping all one way. Pores of the anthers dilated. Style straight. Stigma dilated, five-lobed.—Native of morly alpine woods in various parts of Europe, from Lapland to Greece, as well as of sandy barren woods in North America, from Canada to New Jersey, flowering in July. It occurs in fir or birch woods, in several parts of the highlands of Scotland; as also near Moffat in the lowlands; and according to Ray in Yorkshire. The stem is long and trailing. Leaves scattered or covered, an inch or more in length, with numerous fine shallow ferratures, and abundance of reticulated veins. Flowers from three to six inches long, erect, straight; round below; angular above; with two or three green ovate scales. Clusters of many crowded greenish-white flowers, not half the size of the foregoing, nor so much expanded. Stamen regularly placed round the germin, at first curving, then straight. Anthers whitish, short, pointed; their pores somewhat oblique, but not tubular, soon becoming dilated and jagged. Style straight, twice the length of the flower. Stigma much dilated, annular, but thin-edged, terminating in a large five-lobed umbilicated summit.

10. P. uniflora. Single-flowered Winter-green. Linn. Sp. Pl. 568. Willd. n. 6. Ait. n. 6. Pursh n. 5. Fl. Dan. t. 8. Engl. Bot. t. 146. (P. quarta minim; Chuf. Hift. v. 2. 118. Ger. Em. 408. P. flore singulari; Rivin. Pentap. Irr. t. 139. f. 1.)—Stalk bearing a solitary flower. Pores of the anthers contracted, tubular. Stigma with five rays.—Native of alpine forests, among sandy rills, in various parts of Europe and North America. It was first discovered, in the British dominions, by Mr. James Hoggan, who gathered wild specimens, now before us, in the western islands of Harris and Bernera, in 1783. Mr. James Hoy, and Mr. Brodie of Brodie, have also gathered this most elegant and curious plant in fir woods of the county of Moray. It is, like the red, perennial and evergreen, flowering in July. The leaves vary greatly in size and acuteness, but are generally roundish, about an inch long, more or less strongly ferrature, and reticulated with many veins. Foot-stalk half as long. Flower-stalk solitary, simple, erect, three inches high, with one concave bract, and a large, terminal, white, or slightly reddish, flower, an inch in diameter, and smelling like lily of the valley. Stamen spreading equally, half the length of the corolla, three of them lying on one of the petals, one only on another, and two on each of the three remaining. Anthers short, ovate, pointed; their pores tubular, considerably elongated. Style erect, straight, equal to the length of the germin. Stigma large, of five thick, spreading, acute, red, lobes. The wild specimen delineated in English Botany, having travelled so far a distance, was in too imperfect a condition to allow of that figure being so good as usual.

Section 2. Stigma nearly fimbria. Chimaphila of Pursh.

11. P. umbrata. Umbellated Winter-green. Linn. Sp. Pl. 567. Willd. n. 4. Ait. n. 4. Curt. Mag. t. 778. (P. terris fruticosa; Chuf. Hift. v. 2. 117. Ger. Em. 408. P. folio arbuti; Rivin. Pentap. Irr. t. 139. f. 2.)—Chimaphila Corymbosa; Pursh n. 2.)—Leaves ovate-obovate, ferrature. Flowers somewhat umbellate. Stigma nearly fimbria. Stamens smooth.—Native of woods in the northern parts of Europe, Asia and America, but not found wild in Britain. Mr. Menzies gathered it on the west coast of North America, and Mr. Pursh found it frequent in dry woods, from Canada to Virginia. Linneas, Gmelin, Pollich, Roth, &c. give it in their Floras. Dr. Sims, who received this species in flower in June, from Mr. Lodgises, justly afferts it to be the most beautiful of all the genus. The stem is woody, a span high, somewhat branched, angular, and roughish. Leaves crowded together into something like whorls, falked, narrow-obovate, blunted, strongly ferrature; dark green and veiny above; paler beneath; about an inch and a half long. Foot-stalk terminal, solitary, three inches long, reddish, bearing about five, imperfectly umbellate, simple, partial stalks, each an inch long, spreading, rough with glandular pubescence, and sometimes furnished with a little lanceolate bract. Flowers smaller than that of P. uniflora, but larger than any other of the foregoing, drooping. Petiole obicular, concave, cream-coloured, crinum at the base. Stamen short, red, all regularly inflexed. Anthers short, purple, with white tubular pores, dilated and lobed at the orifice. Germin globose, green. Style thick and very short, but certainly preent. Stigma obicular, convex, with five flight notches. The American species are usually less umbellate, and more racemose, than the European.

12. P. maculate. Holly-leaved Winter-green. Linn. Sp. Pl. 567. Willd. n. 5. Ait. n. 5. Curt. Mag. t. 897. (P. mariana, arbuti folium angustifolius, &c.; Plak. Mant. 157. Phyt. t. 349. f. 4.)—Chimaphila maculate; Pursh n. 1.)—Leaves ovato-lanceolate, with tooth-like ferratures. Stalks two or three-flowered. Stigma nearly fimbria. Stamens woolly.—This is exclusively an American species. Mr. Pursh observed it in shady gravelly or sandy woods, from Canada to Carolina, and Mr. Menzies brought speci-
ments from the north-west coast. It is now and then met
with in our more curious gardens, requiring bog earth, with
shade and moisture, and flowering in June and July. Its
shrubby habit is like the last, but of more humble growth.

Leaves more pointed, with sharper tooth-like serratures;
their upper surface marked, along the rib and veins, with a
pale stripe. Partial flowers, usually two, rarely three,
drooping. Flowers the size of the leaf, but white. Stamens
densely fringed in their lower part. Anthers with tubular
jagged-mouthed pores. Style very short and thick. Stigma
hemispherical, nearly entire, green. Mr. Pursh says this
plant is in high esteem among the natives of North America
for its medicinal qualities, and is called Sip-blenn. He
witnessed a successful cure of severe hysterics by a decoction
of this Pyrola. — We can by no means allude to the
establishment of that able writer's genus Chimaphila, hinted
at by Michaux; there being surely no diversity of habit to
support it; nor any character, but a difference of length
in the style; which the other species of Pyrola shew to
afford admirable specific, but no generic, distinctions.

PYROLAMPIS, in Zoology. See Glow-worm, and
Lampyris.

PYROLINEOUS Acid, or Empyreumatic acid of
wood, in Chemistry, a species of empyreumatic Acetous
Acid (which see), procured by distilling in a glas or
earthen retort a quantity of shavings of any kind of wood,
such as box, guaumatic wood, or beechn; in which an
extremely strong-smelling dark-coloured empyreumatic acid
liquid is obtained, nearly one-third of the weight of the
wood. This acid is furer, and also much blacker and more
empyreumatic, than either the pyrometus or pyroantacmeous
acid, probably as requiring a stronger heat for its production.

The acid of wood is obtained in a large quantity near London,
from the preparation of charcoal for gunpowder, by distilling
wood in cast-iron cylinders. It stains the hands deeply, and
wood indelibly. This acid is procured in such a quantity as to
be an object of manufacture. At the belt it is only an in-
erior acetous acid, and the difficulty of purifying it will
prevent the profitable use of it in many of the arts to which
vinegar is applied. However, as the process for procuring
radical vinegar at the same time purifies this empyreumatic
acid, it may perhaps be used for this purpose. It may be
added, that much of the acid from the distilled charcoal for
gunpowder, near London, is employed by calico-printers
in forming the acetated iron, used as a mordant, as in this
case the colour and smell of the acid are not at all detri-
mental. Some time ago Vauquelin announced, as a new
discovery, that pyrolineous acid is identical the name as
the acetous; but this was known to Glauber near two years
ago. In the folio edition of his works, p. 188, may be
seen directions for its distillation, with a copper-plate of the
apparatus which he employed. He there calls it the vine-

PYROMACHUS, a name given by some to antimony,
when reduced to a flaky hardness; and by others to copper,
when fused with sulphur, and thus rendered less ductile.

PYROMANCY, or Pyromancy, a kind of divination,
performed by means of fire.

The ancients imagined they could foretell futurity by in-
specting fire and flame: to this end they considered its di-
rection, or which way it turned. Sometimes they added
other matter to the fire, e. g. a vessel full of urine, with its
neck bound about with wood, watching narrowly on which
side it would burst, and thence taking their augury.

Sometimes they threw pitch on it, and if it took fire im-
mediately, they esteemed it a good augury.

PYROMETER, formed of γε, fire, and μετρ, I mea-
sure, in Physics, the name of a machine contrived to mea-
sure the alteration of the dimensions of metals, and other
fold bodies, arising from heat.

These instruments have been constructed of various forms;
but as their object is to render the small expansions of
foilds apparent to the observer, they have confined of a ma-
hine adapted to this purpose, and of an apparatus fit for
heating the bodies under examination to a determined degree.

The most usual, and, indeed, the most eligible mode of
heating the bodies, is to place them in water, in which a
therometer is placed, and to heat the water by means of
lamps. The small expansions of the heated solids have been
rendered visible, first, by multiplying-wheels, or by levers,
or by fine screws, which render a small motion communicated
to one end of the mechanism productive of a great move-
ment at the other end; and, secondly, by magnifying the
small expansion through microscopes; which seems, upon
the whole, to be the method that is both most certain and
most manageable; for with wheels and pinions, and even
with levers or screws, there is always some equivocal mo-
tion, arising from the loose connection of teeth and pinions,
or from the leers and bending of other parts.

Mufchenbroek, who was the original inventor of this
machine, has given a table of the expansion of the different
metals, in the same degree of heat. Having prepared cy-
lindric rods of iron, steel, copper, brass, tin, and lead, he
exposed them first to a pyrometer with one flame in the
middle; then with two flames; and successively to one with
three, four, and five flames. But previous to this trial, he
took care to cool them equally, by exposing them some time
upon the flame alone, when it began to freeze, and Fahrenheit's
therometer was at thirty-two degrees. The effects
of which experiment are digested in the following table,
where the degrees of expansion are marked in parts equal
to the $\frac{3}{4}$-width part of an inch.

<table>
<thead>
<tr>
<th>Number of Flames</th>
<th>Expansion of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iron</td>
</tr>
<tr>
<td>By one flame</td>
<td>80</td>
</tr>
<tr>
<td>By two flames placed close together</td>
<td>117</td>
</tr>
<tr>
<td>By two flames 2½ inches distant</td>
<td>109</td>
</tr>
<tr>
<td>By three flames placed close together</td>
<td>142</td>
</tr>
<tr>
<td>By four flames placed close together</td>
<td>211</td>
</tr>
<tr>
<td>By five flames</td>
<td>230</td>
</tr>
</tbody>
</table>

It
PYROMETER.

It is to be observed of tin, that it will easily melt when heated by two flames placed together. Lead commonly melts with three flames placed together, especially if they burn long.

From these experiments it appears, at first view, that iron is the least rarefied of any of these metals, whether it be heated by one or more flames; and therefore is most proper for making machines, or instruments, which we would have free from any alterations by heat or cold, as the rods of pendulums for clocks, &c. So likewise the measures of yards or feet should be made of iron, that their length may be as nearly as possible the same, summer and winter.

The expansion of lead and tin, by only one flame, is nearly the same; that is, almost double of the expansion of iron. It is likewise observable, that the flames, placed together, cause a greater rarefaction than when they have a sensible interval between them; iron, in the former case, being expanded 117 degrees, and only 109 in the latter; the reason of which difference is obvious. By comparing the expansion of the same metal, produced by one, two, three, or more flames, it appears, that two flames do not cause double the expansion of one; nor three flames three times that expansion, but always less; and these expansions differ so much the more from the ratio of the number of flames, as there are more flames acting at the same time.

It is also observable, that metals are not expanded equally at the time of their melting, but some more, some less. Thus, tin began to run, when rarefied 219 degrees; whereas brass was expanded 377 degrees, and yet was far from melting.

As to the construction of M. Muschenbroeck’s pyrometer, together with Defaglier’s alterations and improvements, the curious may consult Defagiler, Experim. Philos. vol. i. p. 421, &c. See also Muschenbroeck’s translation of the experiments of the Academy del Cimento, printed at Leyden in 1731. And for a pyrometer of a new construction, by which the dilatations of metals in boiling fluids may be examined and compared with Fahrenheit’s thermometer, see Muschenbrock, Intr. ad Philosop. Nat. 4to. 1762, vol. ii. p. 610.

But it has been observed, that M. Muschenbroeck’s pyrometer was liable to some objections; and a contrivance was made, with a view of removing thes, by Mr. Ellicott, who has given a description of his improved pyrometer in the Philosophical Transactions, vol. 443. This may also be seen in Dr. Martin’s Abridgment, vol. viii. p. 464.

This instrument is formed with a flat piece of brass A A, (Plate XXIII. Misellany, fig. 4.) which is fixed down to a thick piece of mahogany. Upon this plate are screwed three pieces of brass, two of which, B B, serve to support the flat iron bar G, called the standard bar. The upper part of the third piece of brass is a circle D, about three inches in diameter, divided into three hundred and sixty equal parts; or degrees: within this circle is a moveable plate d, divided likewise into three hundred and sixty parts, and a small slide index. The bar of metal E, upon which the experiment is to be made, is laid on the standard bar. F is a lever two inches and a half long, fastened to an axis, which turns in two pieces of brass, screwed to one of the supports B. To the end of this lever is fastened a chain, or flk-line, which, after being wound round a small cylinder, to which the index in the brass circle, D, is fastened, passes over a pulley, with a weight hung to the end of it. Upon the axis, to which the lever is fixed, is a piece, a quarter of an inch in diameter, to which a piece of watch-chain is fastened, the other end of which is hooked to a strong spring G, which bears against one end of the metal E.

H is a lever, exactly of the same form and dimensions with the other; but the chain fastened to the pulley on its axis is hooked to the standard bar. The line fastened to the end of this lever, after being wound round a cylinder, to which the moveable plate is fixed, passes over a small pulley, and has a weight hung to the end of it; or rather the same line, pulling under a pulley to which the weight is hung, has its other end fastened to the lever F; so that one weight serves for both levers. From this description it is plain, that whenever the bar E is lengthened, it gives liberty to the weight to draw the lever F upwards by its action to the spring G; and the index will, at the same time, by means of the silk line, be carried forward in the circle; and when the bar shortens, it will return back again: the same motion will be communicated to the standard bar. When the bar is lengthened the 20th part of an inch, the index will be carried once round the brass circle, which is divided into three hundred and sixty degrees; and, therefore, if the metal lengthens the 720th part of an inch, the index will move one degree. In order to make an experiment with this instrument, lay a bar of any kind of metal, as E, on the standard bar; then heat this bar to any degree of heat, with a lamp, and mark the degree of its expansion, as indicated by the moveable plate; observe also the degree of expansion of the metal E, by the heat communicated to it from the standard bar, as marked on the brass circle by the index; let the instrument stand, till the whole is thoroughly cold; then removing the bar E, lay any others successively in its place, and proceed exactly as before; and thus the degrees of expansion of different metals, by the same degree of heat, may be estimated.

By the help of this instrument Mr. Ellicott found, upon a medium, that the expansion of bars of different metals, as nearly of the same dimensions as possible, by the same degree of heat, were as follow:

Gold, Silver, Brass, Copper, Iron, Steel, Lead, 73 103 95 89 60 56 149

The great difference between the expansions of iron and brass, has been applied with good success to remedy the irregularities in pendulums arising from heat. Phil. Trans. vol. xlvii. p. 485. See Pendulum.

Mr. Graham used to measure the minute alterations, in length, of metal bars, by advancing the point of a micrometer-screw, till it feebly stopped against the end of the bar to be measured. This screw, being small and very lightly hung, was capable of agreement within the three or four thousandth part of an inch. On this general principle Mr. Smeaton contrived his pyrometer, in which the measures are determined by the contact of a piece of metal with the point of a micrometer-screw. A B C D (fig. 5.) represents the main bar or bars of this instrument; E F is the bar to be measured, lying in two notches, one fixed to the upright standard A B; the other to the principal lever H J; the end E of the bar E F bears against the point of G, a screw which is of use in examining the micrometer-screw; the other end of the bar F bears against a small spherically protuberant bit of hard metal, fixed at the same height as G, in the principal lever H J; K is an arbor fixed in the bars, which receives at each end the points of the screws, H, L, upon which the lever H J turns and serves as a fulcrum to it; O is a slender spring, to keep the lever in a bearing plane against the bar; and P is a check, to prevent the lever from falling forward, when the bar is taken out; N is the feeder, somewhat in the shape of a T, in, suspended, and moveable up and down upon the points of the screws, I, M,
PYROMETER.

I, M, which, as well as L, H, are so adjusted as to leave the motion free, but without shake; Q R is the handle of the feeler, moveable upon a loose joint at R; so that by laying hold of it at Q, the feeler is moved up and down, without being affected by the irregular pressure of the hand; the extremity, S, of the feeler is also furnished with a bit of protuberant hard metal, to render its contact with the point of the micrometer-screw more perfect; T is the micrometer-screw; V the divided index-plate; and W a knob for the handle; the micrometer-screw passes through two solid screwed holes at D and Y; the piece YZ is made a little springy, and endeavours to pull the screw backwards from the hole at D, and consequently keeps the micrometer-screw constantly bearing against its threads the same way, and thereby renders the motion thereof perfectly steady and gentle; X is the index, having divisions upon it, answering to the turns of the screw. This piece points out the divisions of the plate, as the face of the plate points out the divisions upon the index. When the instrument is used, lay hold of the knob at Q with one hand, and, moving the feeler up and down, with the other move forward the screw T, till its point comes in contact with the feeler; then will the plate and index, V and X, show the turns and parts. The basis of this instrument, as well as the other parts of it, is bras: one end of which is terminated of the same piece at right angles, to the height of three inches and a half; and the other end acts upon the middle of a lever of the second kind, whose fulcrum is in the basis; and, therefore, the motion of the extremity of the lever is double the difference between the expansion of the bar and the basis. Hence, having the length of the lever from its fulcrum to the point of suspension of the feeler, the distance between the fulcrum and the point of contact with the bar, the inches and parts that correspond to a certain number of threads of the micrometer, and the number of divisions in the circumference of the index-plate; the fraction of an inch expressed by one division of the plate may be deduced. Those measures are as follow: from the fulcrum of the lever to the feeler, 5.875 inches; from the fulcrum to the point of contact, 2.805 inches; length of seventy threads of the screw, 2.455 inches; and the divisions in the circumference of the index-plate, 100. Hence the value of one division will be the \( \frac{1}{100} \) of part of an inch: but if the screw be altered one-fourth of one of these divisions, when the contact between the screw and feeler is well adjusted, the difference of contact will be very perceptible to the slightest observer; and, consequently, \( \frac{1}{100} \) part of an inch is perceptible in this instrument. When the instrument is made use of, if it is immersed, together with the bar to be measured, in a cistern of water; which water, by means of lamps underneath, is made to receive any intended degree of heat not greater than that of boiling, and thereby communicates the same degree of heat to the instrument, the bar, and to a mercurial thermometer immersed therein, for the purpose of ascertaining that degree. See fig. 6, in which A B is the cistern, C the cover, which, when the instrument (fig. 5.) is raised upon blocks, goes on between the bar E F and the basis B C; D a handle to take off the cover, when hot; E the mercurial thermometer; F the cock, to let out the water; and G H a hollow piece of tin, which supports seven spirit lamps, which are raised higher or lower by the screws I and K, in order to give the water in the cistern a proper degree of heat. With this pyrometer Mr. Smaton performed several experiments, which are arranged in a table; and their result agrees very well, he observes, with the proportions of expansions of several metals given by Mr. Ellicott. The following table shews how much a foot in length of each metal grows longer, by an increase of heat corresponding to 180° of Fahrenheit’s thermometer, or to the difference between freezing and boiling water, expressed in such parts of which the unit is equal to the 10,000th part of an inch.

1. White-glass barometer-tube .................. 100.
5. Iron .................. 151.
7. Copper hammered .................. 204.
8. Copper eight parts, mixed with tin one ........ 218.
10. Bras sixteen parts, with tin one ........ 229.
13. Splelter folder, vis. bras two parts, zinc one .... 247.
15. Grain tin .................. 298.
16. Soft folder, vis. lead two, tin one ........ 301.
17. Zinc eight parts, with tin one, a little hammered .... 323.
18. Lead .................. 344.
19. Zinc or splelter .................. 353.
20. Zinc hammered half an inch per foot ........ 373.

For a farther account of this instrument, with its use, see Phil. Trans. vol. xlvi. art. 79. p. 598, &c.

Mr. Ferguson has constructed and described a pyrometer, which makes the expansion of metals by heat visible to the 45,000th part of an inch. The upper surface of this machine is represented by fig. 7. Its frame, A B C D, is made of mahogany, on which is a circle divided into three hundred and sixty equal parts; and within that circle is another, divided into eight equal parts. If the short bar E be pushed one inch forward (or toward the centre of the circle) the index e will be turned 125 times round the circle of 360 parts or degrees. As 125 times 360 is 45,000, it is evident, that if the bar E be moved only the 45,000th part of an inch, the index will move one degree of the circle. But, as in this pyrometer the circle is nine inches in diameter, the motion of the index is visible to half a degree, which answers to the 90,000th part of an inch in the motion or pulling of the short bar E.

One end of a long bar of metal F is laid into a hollow place in a piece of iron G, which is fixed to the frame of the machine; and the other end of this bar is laid against the end of the short bar E, over the supposing cross-bar H I; and, as the end, f, of the long bar is placed close against the end of the short bar, it is plain that if F expands, it will pull E forward, and turn the index e.

The machine stands upon four short pillars, high enough from a table, to let a spirit lamp be put on the table under the bar F; and, when that is done, the heat of the flame of the lamp expands the bar, and turns the index.

There are bars of different metals, as silver, bras, and iron; all of the same length as the bar F, for trying experiments on the different expansion of different metals, by equal degrees of heat applied to them for equal lengths of time; which may be measured by a pendulum that twangs seconds. Thus.

Put on the bras bar F, and set the index to the 360th degree; then put the lighted lamp under the bar, and count the number of seconds in which the index goes round the plate, from 360 to 360 again; and then blow out the lamp, and take away the bar.

This done, put on an iron bar F where the bras one
The inside of this pyrometer is constructed as follows.

In fig. 8, A a is the short bar, which moves between rollers; and, on the side $a$, it has fifteen teeth in an inch, which take into the leaves of a pinion $B$ (twelve in number), on whose axis is the wheel $C$ of one hundred teeth, which take into the ten leaves of the pinion $D$, on whose axis is the wheel $E$ of one hundred teeth, which take into the ten leaves of the pinion $F$, on the top of whose axis is the index above-mentioned.

Now, as the wheels $C$ and $E$ have one hundred teeth each, and the pinions $D$ and $F$ have ten leaves each, it is plain, that if the wheel $C$ turns once round, the pinion $F$, and the index on its axis, will turn one hundred times round.

But, as the first pinion $B$ has only twelve leaves, and the bar $A a$ that turns it has fifteen teeth in an inch, which is twelve and a fourth part more; one inch motion of the bar will cause the last pinion $F$ to turn one hundred times round, and a fourth part of one hundred over and above, which is twenty-five. So that if $A a$ be pushed one inch, $F$ will be turned one hundred and twenty-five times round.

A silk thread $b$ is tied to the axis of the pinion $D$, and wound several times round it; and the other end of the thread is tied to a piece of slender watch spring $G$, which is fixed in the head $H$. So that as the bar $f$ expands, and pushes the bar $A a$ forward, the thread winds round the axle, and draws out the spring; and as the bar contracts, the spring pulls back the thread, and turns the work contrary way, which pushes back the short bar $A a$ against the long bar $f$. This spring always keeps the teeth of the wheels in contact with the leaves of the pinions, and so prevents any shake in the teeth.

In fig. 7, the eight divisions of the inner circle are so many thousandth parts of an inch in the expansion or contraction of the bars; which is just one thousandth part of an inch for each division moved over by the index. Ferguson's Lectures on Mechanics, Suppl. p. 7, &c. 410.

Another pyrometer was invented by M. De Luc, in consequence of a hint suggested to him by Mr. Ramlden. The blade of this instrument is a rectangular piece of deal board two feet and a half long, fifteen inches broad, and one inch and a half thick, and to this all the other parts are fixed. This is mounted in the manner of a table, with four deal legs, each a foot long, and an inch and a half square, well fitted near its four angles, and kept together at the other ends by four firm crofs-pieces. This small table is suspended by a hook to a fland; the board being in a vertical situation in the direction of its grain, and bearing its legs forward in such a manner as that the crofs-pieces which join them may form a frame, placed vertically facing the observer. This frame sustains a microscope, which is firmly fixed in another frame that moves in the former by means of grooves, but with a very considerable degree of tightness; the friction of which may be incresed by the preffure of four fcrews. The inner flicing frame, which is likewise of deal, keeps the tube of the microscope in a horizontal position, and in great part without the frame, infomuch that the end which carries the lens is but little within the space between the frame and the board. This microscope is constructed in such a manner as that the object observed may be an inch distant from the lens; and it has a wire which is situated in the focus of the glaffes, in which the objects appear reversed. At the top of the apparatus there is a piece of deal, an inch and a half thick, and two inches broad, laid in a horizontal direfion from the board to the top of the frame. To this piece the rods of different subtances, whose expansion by heat is to be measured, are fupped; one end of it flices into a focket, which is cut in the thickness of the board, and the other end, which rels upon the frame, meetts there with a fcrew, which makes the piece move backwards and forwards, to bring the objects to the focus of the microscope. There is a very strongly driven through a hole bored vertically through this piece; and in another vertical hole, made through the cork, the rods are fixed at the top; fo that they hang only, and their dilataion is not counteracted by any preffure. In order to heat the rods, a cylindrical bottle of thin glaffes, about twenty-one inches high, and four inches in diameter, is placed in the inside of the machine, upon a fland independent of the rest of the apparatus. In this bottle the rods are fupped at a little lefs than an inch distance from one of the fides, in order to have them near the microscope. Into this bottle is poured water of different degrees of heat, which must be flired about by moving upwards and downwards, at one of the fides of the bottle, a little piece of wood falted horizontally at the end of a flick: in this water is hung a thermometer, the ball of which reaches to the middle of the height of the rods. During these operations the water rises to the cork, which thus determines the length of the heated part; the bottle is covered to prevent the water from cooling too rapidly at the surface; and a thin cafe of brafs prevents the vapour from fixing upon the piece of deal to which the rods are fixed. This pyrometer is represented in fig. 9, in which $a a$ is the fland to which it is fupped; $b$ the hook from which it hangs; $c c$ the deal-board, which is the basis of the whole apparatus; $d, d, d, d$, four arms, to which is fixed the frame $e e e e$: the other frame which carries the microscope is $f f f f$: $g, g$, are two crofs-pieces, through which passes the tube of the microscope, and which support it near both ends; $h h$ is the microscope; $i i$ its micrometer; $k$ the cork, through which passes the glaffes rod $l l$, and by which it is kept fupped; $m m$ a rod of metal, or any other subtance lefs dilatable than glaffes; $n$ the point of union, obtained by means of two connected rings, in which both rods are falleden by fcrews: above there is another pair of rings, in one of which the metal rod is free, and which rod it supports; $o o$ the piece to the which the glaffes rod is fupped; $p p$ a square piece fixed to the frame by four fcrews, behind which is a box, in which, as well as in a groove cut in the blade in $q q$, the piece $p p$ slides; $r r$ a fcrew, which fasses through the square piece $g g$, whose use is to move backwards or forwards the piece $p p$, in order to bring the surface of the metal rod to the focus of the microscope; $s s, s s, s s$, four fcrews, with round metal plates behind their heads, which serve to prefect the frame of the microscope against the frame $e e e e$: the longitudinal openings, through which the fcrews pas, permit the free motion of the firft frame, when one strikes gently with a hammer to the bottom or the top of one of the fides. If the microscope is wanted higher or lower than the grooves permit, the fcrews may be re-
moved to other holes made on purpose in the side pieces of the frame: it is the cylindrical bottle, in which hung the rods in order to be heated at different degrees by water of various temperatures; \( y_u \), \( y_u \) are the supports of the bottle; \( x \) the thermometer suspended in the water; \( z \) a rod, to the lower end of which is fixed a small plate, to stir the water, by moving it up and down; \( z = \) a syphon, one branch of which is within, and the other without, the bottle, the latter being furnished with a cock, which serves to draw off the quantity of water that is necessary for changing the temperature in the bottle. For a farther account of this instrument, together with the principle of its construction and use, both in the comparative measure of the expansions by heat, and the measure of their absolute expansion, and the experiments made with it, we must refer to an elaborate essay of M. De Luc on Pyrometry, &c. in the Phil. Trans. vol. lxviii. part i. art. 20. p. 419—546.

All the contrivances above described must be considered as inferior to that constructed by Mr. Ramden, of which general Roy has given an accurate and minute account in the Phil. Trans. vol. xxx. p. 462. We shall here give such an account as our limits will allow of this instrument, says major-general Roy, that it seems not easy to improve it; and refer for a fuller account illustrated by appropriate drawings. This pyrometer, named the microscopes, because by means of two microscopes attached to it, the expansion is measured, consists of a strong deal frame, 5 feet long, nearly 28 inches broad, and about 42 inches in height. The metallic bar, whose expansion is to be measured, and which may be even five feet long, is placed in a copper trough little longer than five feet; and this is placed over 12 spirit lamps, the flames of which heat the water of that trough fully to the boiling point, and of course heat the bar which is plunged into it. Two other wooden troughs, also full of water, are placed parallel to, and at a little distance from, the copper one. Each of these contains a cast-iron prismatic bar. To the ends of one of these bars two microscopes are fastened in an horizontal situation, perpendicularly to the bars. One of these microscopes is furnished with a micrometer, or mechanism, to measure the magnified image of an object; the other microscope has a sable mark. The parts of the microscopes, as well as the proper marks for measurement, are separated and dipped, partly upon the ends of the cast-iron rods, and partly upon the ends of the rod under examination, that if any of them be lengthened or shortened, that alteration is clearly perceived through the microscopes, and may be measured by means of the micrometer. It follows, that if the temperature of the cast-iron prismatic bars be kept unaltered, whilst that of the bar under examination is increased, then the increase of length, which is measured by the micrometer, must be attributed to that bar only, and by these means the expansions of seven substances were ascertained. For further particulars relating to the construction and use of this instrument, we refer to the Transact. (ubi supra), and to the article Expansion in this Cyclopaedia. For an account of Wedgwood's pyrometer, see Thermometer. Also, for a description of Mr. Troughton's pyrometer, we are under the necessity of referring to the fame article.

PYROMUCOUS Acid, or Empyrumatic acid of sugar, or Syrupus acid, is different from the acid of sugar, or Oxalic Acid, (which see) and denotes that prunent acid vapour of sugar, or any saccharine matter strongly heated, which is familiar to every person who has ever entered a sugar baking-house. It is prepared by chemists in the following manner: Put into a very large glas retort any quantity of pulverized sugar of any kind, so as to fill only one third of it, as the matter very much swells in the process; adapt to it a large receiver, not closely luted, and heat it gradually on a sand-bath. A great quantity of gas arises when the sugar begins to be scorched, which is mostly carboxic acid mixed with an inflammable gas, probably the gaseous oxvd of carbon. In the receiver is condensed a weak acidulous liquor, coloured by an oily matter, and also apparently foamed by a portion of fuliginous matter volatilized during the distillation. The quantity of acid, obtainable in this process, varies according to the regulation of the fire, which should at least be pushed so as to make the retort red-hot, and to reduce the sugar to a perfect charcoal; but in general about 5ths of the weight of sugar may be obtained of the distilled acid. Gum mucilage, manna, honey, starch, and other mucous or mucin-faccharine substances, yield, by distillation, the same acid as sugar. Aikin, Dict. Min.

PYROMONIA, a term used by the chemical writers to express the art of regulating fire, so as to make it subserve to all their processes in a determinate degree. 

PYROPE, in Mineralogy, a precious stone, formerly called the Bohemian garnet. (See Garnet.) The colour is a dark blood red; when held between the eye and the light, the red colour inclines to a yellow. The pyrope is never found crystallized, but occurs in small round or angular fragments imbedded in serpentine rock, or scattered in the sands on the sea-shore, and in alluvial ground. It feriates quartz. The specific gravity is stated by Klaproth 3:718. On account of its lustre, transparency, colour, and hardness, it is much prized by jewellers. The small grains, when powdered, are applied to cut softer stones. According to Klaproth, the constituent parts of pyrope are:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silex</td>
<td>40.0</td>
</tr>
<tr>
<td>Alumine</td>
<td>26.50</td>
</tr>
<tr>
<td>Magnesia</td>
<td>10.00</td>
</tr>
<tr>
<td>Lime</td>
<td>3.50</td>
</tr>
<tr>
<td>Oxyd of iron</td>
<td>16.50</td>
</tr>
<tr>
<td>Oxyd of mangan</td>
<td>0.25</td>
</tr>
<tr>
<td>Lofs</td>
<td>1.25</td>
</tr>
</tbody>
</table>

B.

PYROPHAGI. See Fire-Eaters.

PYROPHANES, in Mineralogy, a variety of the semi-opal; so called because, being heated in a fagon, it becomes transparent, but returns to its opaque state when cold, as Mr. Landriani has discovered. M. Saffures, junior, renders common hydrphanes transparent, and of a topaz colour, when heated by digesting them in melted wax. It is said that some pyrophanes are found in Armenia, which are transparent while exposed to the sun, and opaque at night. See Gem.

PYROPHORUS, formed of \( \nu_{10} \), fire, and \( \iota, \rho \), bear, in Chemistry, the name generally given to that substance called some black phosphorus; a chemical preparation possessing the ignilur property of kindling (spontaneously when exposed to the air.

This substance was accidentally discovered by M. Homberg, who prepared it of alum and human faces. (See Phosphorus Exaltata.) See also M. Le Fevre's preparation, described under Phosphorus of Sulphur.

It was apprehended for a considerable time after the discovery, that human faces were essential to the operation, till the yeungest son of the great Lernery found, that honey, sugar, flour, and, indeed, any animal or vegetable matter, might be substitiuted instead of the human faces; and since that time, M. de Stigny has shown that most vitriolic faults may be substituted for the alum, having added to the al-
PYROPHORUS.

The spontaneous ignition of the aluminous pyrophorus, on its being exposed to the air, has been a subject of considerable discussion among chemists and philosophers; several of whom have adopted the hypothesis proposed by M. de Suvigny, in the Mémoires de Mathématique et de Physique, tom. iii. To explain this curious appearance, M. de Suvigny observes, that the vitriolic acid in the alumin, during the calcination in the phial, leaves its earthy basis, and unites with the phlogiston in the coal. By its union with this inflammable matter, a part of it is undoubtedly rendered volatile, and exhaled partly under the form of volatile vitriolic acid, and partly in that of a blue sulphurous flame; while another part of it combines with the phlogiston forming a real sulphur, or an earthly hepar sulphuris; in which the sulphur is protected from the fire by the earth with which it is combined, and the particles of which remain every where intermixed with those of the powder. Thus far (says Mr. Bewley, an excellent chemist and philosopher) M. de Suvigny is supported by the appearances, and by a just chemical analysis of the powder: but he proceeds farther, and supposes that, at the end of the process, a part of the vitriolic acid is left in a disengaged, or uncombined state, and highly concentrated. In this state it is well known that this acid attracts moisture, and at the same time generates a considerable degree of heat. When the pyrophorus, therefore, is exposed to the air, it again supposes that this disengaged and concentrated acid suddenly attracts the watery particles floating in the atmosphere, and by the heat thus generated, sets fire to the sulphur and other inflammable matter contained in the powder. This hypothesis he has endeavoured to establish by the following observations: that the pyrophorus, as he apprehends, can be made only with substances fit for producing sulphur, or with sulphur itself:—that no pyrophorus will be produced, if the mixture be calcined by too long or too violent a fire; because then the whole vitriolic acid can be combined into perfect sulphur, and consequently is engaged, and not in a proper state to attract the moisture of the air; or else if it does not combine into sulphur, being half disengaged from its basis, it is driven off by the violence or long continuance of the fire; and, consequently, after this complete calcination, no acid remains partly disengaged, as it ought to be, that it might unite with the water with sufficient activity:—that when the pyrophorus is very slowly moistened, as when it is kept in a bottle not well closed, it does not kindle, because sufficient heat is not produced by this slow and gradual attraction of water; it is also spoiled and rendered incapable of kindling, when exposed to the open air; because its acid becomes then satu-rated, or nearly saturated with moisture, and cannot, therefore, unite with that of the air with sufficient activity:—that a pyrophorus, thus spoiled by exposure to moisture, may be restored to its peculiar properties by making it again red-hot in a matrafs; hence by this calcination its partly

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difegaged acid is again concentrated, and refines all its force of combining with water;—and, lately, that the inflammation of the pyrophorus is accelerated by placing it upon a paper a little wetted, or by breathing upon it; because the acid then attracts the moisture more hastily, and consequently with more heat.

M. de Suvigny extends the fame reasoning to the several other pyrophors which he discovered, similar to that of alum; particularly to those which are made by subbituting vitriolated tartar, Glauber's salt, and other vitriolic salts with metallic, earthy, or alkaline bases, in the room of alum. Mr. Bewly has examined this hypothesis with his usual acuteness and accuracy; and from numerous well-conducted experiments he is led to conclude, that pyrophors of all the above-mentioned kinds may be prepared, differing from them in no other particular, except that they contain no vitriolic acid, and which nevertheless kindle as readily, on being exposed to the air, as those which have been impregnated with that principle. In order to shew that the presence of vitriolic acid is not necessary to constitute the pyrophorus made with vitriolated tartar, he added to a quantity of this tartar more than an equal weight of powdered charcoal, and calcined the mixture a long time, in a red heat, in an open crucible; frequently stirring the powder, in order to expel from it as much of the vitriolic acid as possible; the calcination was also sometimes repeated with fresh charcoal; and yet on heating the dust, thus deprived of a considerable part of its acid, with charcoal, in a crucible or tobacco-pipe, in the manner which we shall here subjoin, he observed no diminution in its quality of producing a pyrophorus.

Mr. Bewly, in several of his experiments, made use of the bowl of a tobacco-pipe, in which he combined the materials, which he wished to examine in small quantities, and in an expeditious manner; pressing them down lightly, so as to fill half or three-fourths of the bowl, and filling the remainder of it with fine sand. This is kept in a red heat twenty minutes, or half an hour; or it may continue there two hours longer, if the operator pleases, without any injury to the pyrophorus. The pipe being taken out of the fire, the matter is knocked out of it as soon as it becomes cool, and generally, pretty soon afterwards, takes fire spontaneously. Thus he formed his pyrophorus with a mixture confounding of two parts of alum, previously calcined in a red heat; and of powdered charcoal and salt of tartar each one part.

In another experiment, having added successively various and increasing quantities of fixed alkalii to the salt heated as above, till the vitriolic acid contained in the mixture might be considered nearly as an evanescent quantity, a pyrophorus was still produced on calcining it with charcoal as before. He also mixed equal parts of salt of tartar, and vegetable or animal coal, or sometimes three parts of the former with two of the latter, and calcined them in the usual manner; and this composition, on being exposed to the air, generally kindled in half a minute or a minute; though, as it contained no sulphur, it did not burn with so much vivacity as the vitriolic pyrophori. This, which Mr. Bewly calls the alkaline pyrophorus, differs in no circumstance from M. de Suvigny's neutral pyrophori, except in its not containing that principle to which he ascribes their accession. However, let it might be suspected that the falt of tartar which he employed might accidentally contain vitriolated tartar, or vitriolic acid, he repeated the experiment with tartar calcined by himself, as well as with nitre fixed or alkaliised by deflagration with charcoal, and with iron filings; and in all these cases with the same result. By diversifying in a like manner M. de Suvigny's experiments on the metallic pyrophori, Mr. Bewly found that none of the three vitriols, heated with charcoal alone, in its usual method, could produce a pyrophorus. And thus he found that the addition of an alkaline salt to the composition, which was a part of M. de Suvigny's process, was essential to its success.

Treating in the usual manner equal parts of calcined green vitriol and charcoal, the powder which contained no sulphur nor hepar sulphuri, did not acquire any of the properties of a pyrophorus. The vitriolic acid seemed to have been entirely diffused; having no bafe to detain it, when diffused from the metallic earth. The charcoal and cals of iron, left in this process, were calcined again, together with some salt of tartar; and a pyrophorus was produced, which exhibited indications of its containing a scarcely perceptible portion of hepar sulphuri. Thirty grains of crocus martis affringsens were calcined with fifteen grains of charcoal, and the fame quantity of salt of tartar; and the mixture burnt spontaneously, though it contained no hepar sulphuri, or vitriolic acid. Having by these experiments evinced that metallic pyrophori may be prepared without vitriolic acid, Mr. Bewly proceeded to form an aluminous pyrophorus of the same kind. For this purpose, he procured the earth of alum by a long and violent calcination; and examining a part of it, he found, by the usual tests, that it neither contained any sulphur, hepar sulphuri, nor alum undecomposed. This he considered as perfectly pure, though he afterwards found that it contained a small quantity of vitriolated tartar; and yet it repeatedly furnished a pyrophorus as active as when alum itself is employed. From these and similar experiments he infers, that the several kinds of pyrophorii are not kindled by moisture attracted by the vitriolic acid, as M. de Suvigny has maintained; and his conclusion is farther confirmed by some experiments of Dr. Priestley, from which it appears, that they are kindled in dry, nitrous, and dephlogificated air.

M. Proust, cited by Mr. Bewly, describes a variety of new pyrophorii, which neither contain vitriolic acid, nor seem likely to owe their accession to the attraction of humidity from the air. These principally consist of a coaly matter finely divided by metallic or other earths; such are the sediment left in the filter in preparing Gould's extract, various combinations of tartar, or its acid, or the acetous acid with metals, calcined earth. Mr. Bewly, having evinced the insufficiency of M. de Suvigny's theory, and discovered that the pyrophorii are not kindled by moisture, attracted (merely) by the vitriolic acid, directed his attention to the nitrous acid, which Dr. Priestley has shown to be a constituent part of atmospheric air, as the probable agent in the production of this phenomenon. The strong affinity which this acid has with phlogiston, and the heat, and even flame, which it is known to produce with certain inflammable matters, manifested that it was equal to the effect; and having excluded the vitriolic acid from having any essential concern in this operation, he fuggeled, either that the pyrophorus is kindled by moisture attracted by some of the other ingredients which compose it; or that it has the power of decomposing atmospheric air, by suddenly attracting its nitrous acid, and thereby generating a heat sufficient to kindle the phlogistic matter contained in it. This idea appeared plausible, when he farther considered that Dr. Priestley produced the purest inflammable air with this fame acid and with other principles; and that this as well as common air is diminished, and probably in part decomposed, in a variety of phlogistic processes. This ingenious writer concludes, upon the whole, from the experiments he hath made, that the pyrophorus seems to owe its ignifemo
lar property to its being a combination of earth or alkali with phlogiston; the vitriolic acid, when present, only occasionally increasing or diminishing the effect, according to circumstances. In the process of calcination, the earth or alkaline principle is not merely mixed, but actually, though loofely, combined with the phlogistic principle of the coal; so that the pyrophorus, considering it in its molt simple state, is only a perfectly dry phlogisticated alkali or earth. On these data, the phenomena may be explained in the two following methods; with respect particularly to the influence of moisture and heat upon the pyrophorus. Supposing either the alkaline or earthy principles to have a greater affinity to water than to the phlogiston with which either of them is united, they may be exposed to a moist atmosphere, attract the humidity, and therefore set the phlogistic principle at liberty; which may, in its turn, attract and be ignited by the suppoaced aerial acid, it's strong affinity to which is well known:—or, if this hypthesis be rejected, the inflammable matter may be kindled, merely in consequence of the heat produced by the combination of the alkali, &c. with moisture. This reasoning, however, supposes the existence of phlogiston, which modern chemists have generally explodned.

The chemical changes that take place during the formation and decomposition of pyrophorus, as they are stated by Aikin, appear to be the following: 1. By being heated below redness in the open air, the ingredients enter into fusion, and thus mix accurately with each other; then the water of crystallization is driven off from the alum, and of the fugar or flour, little else than the charcoal escapes volatilization. 2. The red heat to which it is expsoed in the phial causes the sulphuric acid of the alun and charcoal of the fugar to react on each other, by which part of the charcoal is driven off in the form of carbonic acid, and part of the sulphuric acid escapes as sulphuric acid. The blue flame that characterizes the latter part of this process is probably caused by the volatilization and combustion of a portion of sulphur, more than is requisite to saturate the potash of the alun. Thus the pyrophorus, when prepared, consists of alumine, charcoal, and sulphuret of potash in intimate mixture. 3. When this powder is exposed to the air, a rapid decomposition of the air itself, and of the moisture which it contains, takes place, the oxygen of each being absorbed by the fugar, while a sufficient quantity of heat is diffegaged, to bring the charcoal and remainder of the sulphur to a state of actual inflammation. See on the subject of this article, Macquer's Chemical Dict. art. Pyrophorus; and Priestley's Obs. on Air, vol. iii. Appendix, p. 386, &c. vol. iv. Appendix, p. 479, &c. Aikin's Dictionary.

PYROPHYLACIA, a term used by Kircher and some others, to express those magazines of fire which are placed in the cavities of mountains and other hollows of the earth, and serve to supply the several volcanoes in the different parts of the world. See Volcano.

PYROPHYSALITE, in Mineralogy, is so called from τως, fire, and ψαλτης, a bubble, because this mineral emits bubbles when exposed to the flame of the blowpipe. It is found at Embo, near Falhun, in Sweden, imbedded in a granitic rock. The colour of pyrophysalite is white, inclining to green, and occasionally small spots of blue fluor spar are seen on its surface. It commonly occurs in oblong pieces, some of which approach to an irregular rhomboid. It differs from felspar, to which it has the most resemblance, in having but one determinate direction in which it can be split; its specific gravity is also greater, and it fusces more easily. The fragments scratch glass, but are less hard than quartz. The powder of the finest fragments emit a phosphorescent light when heated. Its specific gravity is 3.45, and the constituent parts, according to Hefinger and Bertzelius, are:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumine</td>
<td>3.5</td>
</tr>
<tr>
<td>Silex</td>
<td>3.28</td>
</tr>
<tr>
<td>Lime</td>
<td>2.88</td>
</tr>
<tr>
<td>Oxid of iron</td>
<td>1.88</td>
</tr>
<tr>
<td>Volatile matter</td>
<td>.75</td>
</tr>
<tr>
<td>Lofs</td>
<td>11.26</td>
</tr>
</tbody>
</table>

The substance lost during the process is suspected to be fluoric acid. Hairy clusses this mineral with the topaz. See Topaz.

PYROPÆCILOS, in the Natural History of the Ancients, the name by which they call the granite of Arabia, commonly known to this day under the name of the Oriental granite.

The name is derived from the Greek, πυρ, fire, or fire-coloured, and ἀκτίων, spotted; and the ancients having used the epithet fiery to yellow, as well as red, some have imagined the granite must be a yellow stone; but it is evident that red is the colour meant by it here.

PYROSCOPE, an instrument invented by professor Leflieu for measuring the intensity of fire. This is merely the differential Thermometer (which fee), with one of its balls covered with silver leaf, while the other is naked. The fire heats the naked ball, but not the silvered ball. Hence the liquid in the tube rises or falls, according to the intensity of the fire, and of course marks that intensity.

PYROSCOPIA, formed of πυρ, fire, and σκοπεω, I consider, among the Greeks, a kind of divination, being the same with pyromancy and ignigraphia.

PYROSIS, in Medicine, called in Scotland the water-broth; is a disorder of the stomach, which is characterized by a sudden and violent attack of pain in that organ, followed by a copious discharge of a colourless, insipid, and generally cold fluid, resembling saliva, from the oesophagus, mouth, and throat.

The first description of this disease was given by Linneus, as a common affection of the Laplanders, under the appropriate appellation of Cardialgia putatorium; whence Sauvages gave it the denomination of pyrosis Succina. (Nefol. Meth. clas vii. gen. 18.) Dr. Cullen adopted the generic term pyrosis, and deems it an idiopathic disease. It seems to occur, however, in conjunction with other forms of indigestion, and might have been arranged as one of the symptoms of dyspepsia.

The fits of pyrosis usually come on in the morning and forenoon, when the stomach is empty. The first symptom is a pain at the pit of the stomach, with a sense of contraction, as if the stomach were drawn towards the back: the pain is increased by raising the body into an erect posture, and therefore the patient bends himself forward. This pain is often extremely severe, with a sense of burning; and after continuing for some time, it brings on an eruption of a thin watery fluid in considerable quantity. This fluid has sometimes an acrid taste; but most commonly it is described as being absolutely insipid. It continues to be brought up for some time, and does not immediately give relief to the pain which preceded it; but at length it terminates the pain, and the fit ceases.

These paroxysms come on without any evident cause, nor is the origin of the disease always to be imputed to any particular form of diet. It seldom, if ever, attacks those people who use fresh animal food daily; but appears to be most common among those who live almost entirely upon tea, milk, potatoes, and farinaceous substances. It is much more common
common in women than in men; sometimes it attacks pregnant women, and often those who labour under leucorrhœa. It seldom occurs in any one before the age of puberty, or in those who are considerably advanced in life; when it has once taken place, it is very prone to recur occasionally for a long time afterwards. It is more common in Scotland than in this country, and chiefly affects the lower classes of the people.

While the same diet is continued, it is not always easy to cure the disease. The paroxysm is most effectually relieved by anodynes, especially opium; hyoscynamus, &c. answer a similar purpose; and with less certainty; other stimulants and antipatmals, as sulphur, ammonia, the tincture of guaiacum, &c. alleviate the fit. These remedies, however, do not materially contribute to prevent the recurrence of the paroxysms; and butters, aromatics, and the whole of the remedies against indigestion, have been often employed in vain. A combination of aromatic fixatives, with strong alkalis and narcotics, have appeared to the writer of this article to be on the whole the most effectual remedies. See Cullen, Fifth Lines, vol. iv. p. 1.

Pyrosis is also a word used to express an intense heat and readvts in the face, such as of those persons who travel in extremely hot weather, and the like.


Gen. Ch. Cal. Perianth superior, short, in four deep, acute, broad segments, deciduous. Cor. of one petal, somewhat bell-shaped; tube thrice as long as the calyx, gradually upwards; limb of the same length, in four acute, equal, spreading segments, throat downy. Stem. Filaments four, short, inserted into the tube of the corolla, alternate with the segments of the limb; anthers oblong, erect, pointed, shorter than the limb. Pet. Germen tuberous, inferior; style short, cylindrical; stigma capitulate. Peric. Berry small, dry, pear-shaped, with eight furrows, and eight cells, distinct of any crown. Seeds solitary in each cell.

Eff. Ch. Calyx four-toothed. Corolla bell-shaped, four-cleft, downy in the throat. Berry inferior, obovate, with eight furrows and eight seeds.

Obf. Jaffeu, by an error which seems typographical, attributes five segments to the corolla, which Willdenow copies. There are, however, but four, as the analogy of the other parts, in this case, necessarily requires.

1. P. falteae. Willow-leaved Straw-berry. Willd. n. 1. (Prunus hoesides; Lamarck Illust. v. 1. 289. t. 68. f. 2. (not f. 4.)—Gathered by Commerson, in the Isle of Bourbon; not, as Willdenow has it, the Mauritius. A shrub, with round, smooth, greyish, leafy branches. Leaves opposite, on short stalks, rather crowded, two or three inches long, elliptic-lanceolate, sharp-tipped, entire, coriaceous, smooth, with one rib, and several lateral incurved veins, occasionally accompanied by an axial gland-like tubercle, that seems accidental; paler beneath. Sepals between the fruit-stalks, and of the same length, awl-shaped, erect, dilated at the base, deciduous. Flowers—stalks axillary, solitary, somewhat umbellate, bearing one or more simple, single-flowered, partial stalks, with a pair of oblong tapering bracts at the base of the latter. Flowers hardly a quarter of an inch long, erect, apparently white. Fruit, according to Lamarck, near an inch in length, pear-shaped, umbilicate, with eight deep longitudinal furrows. When cut transversely, it throws the eight seeds, compressed, and radiating from the centre.

PYROTARTAREOUS ACID, or Empyreumatic acid of tartar, a species of empyreumatic acetic acid, very different from Tartaric acid; which see. To procure this acid, distil any quantity of cream of tartar in a glass or earthen retort, and as in the process for Pyrometric Acid; the retort being half full of the tartar, on raising the fire very slowly, the first produce is a limpid, acidulous, somewhat bitterish water, after which, as the heat increases, a moat prodigious volume of the inflammable gas is given out, together with a stronger acid, and more empyreumatic liquid, and at last a black oil, and some volatile alkali.

The whole quantity of liquid acid procured from tartar in this method, is generally not more than about a quarter of the weight of the tartar, and is not quite so brown, nor so highly empyreumatic as the pyrometarum. This acid, and also the pyrrogous and pyromucous acids, are capable of very considerable purification by easy methods, so that they lose their empyreuma, their peculiar taste and smell, in which confit their characteristic differences, till at last, when brought into the most concentrated state by some of the modes in which vinegar is dephtegmated, they exhibit the characters of acetic acid so unequivocally, that no doubt can be entertained of their identity. Simple rectification, or redistillation in a very gentle heat, and slopping the procents when the liquor at last comes over much coloured, will purify, to a very great degree, the pyromius and pyrrolicher acids: the latter, by this process, from being of a dark coffee colour, assumes the hue of very pale clear brandy. But on long exposure to light, it again becomes brown, for it retains its empyreumatic character more than any other. Charcoal, newly burnt and powdered, contributes very much to the purification of all these acids; they may be either gently distilled off, or even merely filtered through a stratum of it. But the most effectual method of purification is by uniting these acids with lime, or a fixed alkali, evaporating to dryness, and then expelling the acid by means of the sulphuric acid, in the same manner as the concentrated vinegar is prepared. The acid vapour that rises in this process has now lost its empyreuma almost entirely; has both the strength and the powerful odour of radical vinegar; when again united to potash, forms acetated potash, which may be obtained white by repeated crystallization, or by charcoal powder, and in short in perfect acetic acid. Aikin.

PYROTECHNY, derived from the Greek words πυρ, fire, and τεχνη, art, is a term applied to the art or science which teaches the management and application of fire in certain operations. Although this term has been used in a very extensive sense by some writers, and applied to the use and structure of fire-arms and artillery employed in the art of warfare, yet it is commonly confined, as it will be in this work, to those articles and instruments made use of for amusement, and for grand public occasions, as the celebration of victories, the demonstrations of public joy on account of peace, after long continued war, &c.

Of the origin of artificial fire-works there is nothing certain recorded. In Europe the invention of them is of recent date, and is given to the Italians. The use of fire-works in China was very general long before they were known in European countries; and from an account given of some recent exhibitions at Pekin, it should seem that they have attained to a degree of perfection not surpassed even by the artists of England, France, or Italy. "The fire-works, in some particulars," says Mr. Barrow in his Travels in China, "exceeded any thing of the kind I had ever seen. In grandeur, magnificence, and variety, they were, I own, inferior to the Chinese fire-works we had seen at Batavia, but infinitely superior in point of novelty, neatness, etc."
neatness, and ingenuity of contrivance. One piece of machinery I greatly admired; a shell five feet square was hoisted up by a pulley to the height of fifty or sixty feet from the ground; the bottom was so constructed as then suddenly to fall out, and make way for twenty or thirty rings of lanterns enclosed in a box to descend from it, unfolding themselves from one another by degrees, so as at last to form a collection of full 500, each having a light of a beautifully coloured flame burning brightly within it. This deviation and development of lanterns were several times repeated, and, at every time, exhibited a difference of colour and figure. On each side was a correspondance of smaller boxes, which opened in like manner as the others, and let down an immense net-work of fire, with divisions and compartments of various forms and dimensions, round and square, hexagons, octagons, &c. which were like the brightest burnished copper, and flashed like prismatic lightning with every impulse of the wind. The variety of colours with which the Chinese have the secret of clothing fire feems one of the chief merits of their pyrotechny. The whole concluded with a volcano, or general explosion and discharge of stones and flames, kiphus, crackers, rockets, and granadoes, which involved the gardens for above an hour in a cloud of intolerable smoke."

The apparatus used in making fire-works consists of solid wooden cylinders, called cartridge, for rolling the cases on; similar cylinders, either of wood or metal, for ramming down the composition; moulds for holding the cases while filling; a machine for contracting the cavity of the cases; another for grinding the materials; and a particular apparatus for boring some cases after they are filled.

Construction of the Cartridges for Rockets. — A rocket is a cartridge, or case made of stiff paper, which, being filled in part with gunpowder, saltpetre, and charcoal, rifes of itself into the air when fire is applied to it. There are several kinds and sizes of rockets, but the three following are the principal: viz. 1. Small ones, the calibre of which is not larger than that of a bullet of a pound weight. 2. Rockets, the calibre of which is equal to the size of a ball of from one to three pounds weight. 3. Large rockets, equal to a ball of from three pounds to a hundred weight.

To give the cartridges the same length and thickness, they are put into a hollow cylinder of metal, or strong wood. This mould is not to be confounded with another piece of wood, called the former or roll, to which is rolled the thick paper employed to make the cartridge. The rule for the size of the mould and roller is this: if the calibre of the mould be divided into eight equal parts, the diameter of the roller must be equal to the sum of those parts; of course the vacancy between the roller and the interior surface of the mould is equal to a fourth of the calibre of the mould, which will be exactly filled by the cartridge.

The size of the mould is measured by its calibre; but the length of the moulds for different rockets does not always bear the same proportion to the calibre, the length being diminished as the calibre is increased. In small rockets, the length of the mould ought to be six times the diameter of the calibre; but in the larger fixed rockets, it need not be more than between four and five times the calibre of the mould.

Large stiff paper of a peculiar kind is employed in making cartridges, and hence it has obtained the name of cartridge-paper. This paper is wrapped round the roller, and then cemented by means of common paste. When the cartridge is formed, the roller is drawn almost out, by turning it round, until it is distant from the edge of the cartridge the length of its diameter. A piece of cord is then made to pass twice round the cartridge at the extremity of the roller; and into the vacancy left in the cartridge another roller is introduced, so as to leave a space between the two. By means of the cord, the cartridge must be pinched till there remains only an aperture capable of admitting an instrument called a piercer; then the cord is removed, and its place is supplied by a piece of packthread.

Besides the roller, a rod is employed to load the cartridge, which must be somewhat smaller than the roller, that it may be easily introduced into the cartridge. This rod is pierced lengthwise to a sufficient depth to receive the piercer, which must enter into the mould, and unite with it exactly at the lower part. The piercer, which decreases in size, is introduced into the cartridge through the part where it has been choaked, and tapers to preserve a cavity within it.

After the cartridge is placed in the mould, the prepared composition is to be poured gradually in, and rammed down with great accuracy. When the cartridge is about half filled, separate, with a bodkin, half of the folds of the paper which remains, and having turned them back on the composition, press them down, and pierce three or four holes in the folded paper, by means of a piercer, which must be made to penetrate to the composition of the rocket. These holes serve to form a communication between the body of the rocket and the vacancy at the extremity of the carriage, as it is called, or that part which has been left empty. In small rockets this cavity is filled with granulated powder, and covered over, which serves to let them off; in those that are larger, the pot, containing flares, serpents, and running rockets, is adapted to it.

It now remains to affix the rocket to its rod, which is thus done. When it has been constructed, in the way just described, it is to be fastened to a rod of light smooth wood. Its length and weight must be proportioned to the size of the rocket; that is, it ought to be as long as to remain in equilibrium with it, when suspended on the finger, or other fulcrum, within an inch, or an inch and a half of the neck. Before it is fixed, place it with the neck downwards, and let it rest on two nails, in a direction perpendicular to the horizon; and to make it ascend to a greater height, adapt to its summit a pointed cap made of stiff paper, which will serve to facilitate its passage through the air. To these rockets may be added several other things, as a petard, which is a box of tin plate filled with fine gunpowder, placed on the summit. The petard is placed on the composition, at the end where it has been filled, and the remaining paper of the cartridge is folded down over it, to keep it firm. The petard produces its effect when the rocket is in the air, and the composition is consumed. A representation of a rocket completely fitted up is given in Plate Pyrotechny, fig. 2.

Stars, serpents, &c. may be added to them, which is done by adjusting to the head of the rocket an empty pot or cartridge, larger than the rocket, in order that it may contain the things intended to render the exhibition more beautiful. The following tables are necessary to those who would manufacture rockets for themselves. The first shews the size of the calibre of the mould for rockets of a pound weight and below; and the second points out the size required for the calibre of moulds of from 1lb. to 50lbs. It must be observed, that a pound rocket is that which is just capable of admitting a leaden bullet of a pound weight, and so of the rest.

Table
PYROTECHNY.

Table I.—Size of the Calibre of Moulds of a Pound Weight and below, to One Ounce.

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<thead>
<tr>
<th>Weight of Rockets in Ounces</th>
<th>Diameters in Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>19.5</td>
</tr>
<tr>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>14.5</td>
</tr>
<tr>
<td>6</td>
<td>14.5</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>11.5</td>
</tr>
<tr>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>1</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Here it is evident that the mould of a rocket of twelve ounces in weight ought to be nineteen lines in diameter; one of five ounces will require a mould of thirteen lines in diameter. Hence we derive an easy method of finding the size when the weights are given; and if the diameter of the rocket be given, it will be equally easy to find the weight of the ball corresponding to that calibre. Thus, if the diameter be fifteen lines, it will, by the table, be seen that it corresponds to a ball of eight ounces.

Table II.—Size of the Calibre of Moulds, of from 1 to a 50lb. Ball.

<table>
<thead>
<tr>
<th>Pounds, Calibre</th>
<th>Pounds, Calibre</th>
<th>Pounds, Calibre</th>
<th>Pounds, Calibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>14</td>
<td>241</td>
</tr>
<tr>
<td>2</td>
<td>126</td>
<td>15</td>
<td>247</td>
</tr>
<tr>
<td>3</td>
<td>144</td>
<td>16</td>
<td>252</td>
</tr>
<tr>
<td>4</td>
<td>158</td>
<td>17</td>
<td>257</td>
</tr>
<tr>
<td>5</td>
<td>171</td>
<td>18</td>
<td>262</td>
</tr>
<tr>
<td>6</td>
<td>181</td>
<td>19</td>
<td>267</td>
</tr>
<tr>
<td>7</td>
<td>191</td>
<td>20</td>
<td>271</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>21</td>
<td>275</td>
</tr>
<tr>
<td>9</td>
<td>208</td>
<td>22</td>
<td>286</td>
</tr>
<tr>
<td>10</td>
<td>215</td>
<td>23</td>
<td>284</td>
</tr>
<tr>
<td>11</td>
<td>222</td>
<td>24</td>
<td>288</td>
</tr>
<tr>
<td>12</td>
<td>228</td>
<td>25</td>
<td>292</td>
</tr>
<tr>
<td>13</td>
<td>235</td>
<td>26</td>
<td>296</td>
</tr>
</tbody>
</table>

By this second table, if the weight of the ball be given the size of the mould may be found: suppose it be 18 pounds, opposite to it is the number 262. Then we lay by the rule of proportion (as 15 : 262 : 14 : x) therefore the required calibre is 18 lines nearly, or four inches and four lines, or 4 1/2 inches. But if the calibre be given in lines, the weight of the ball may be found: suppose the given calibre be 36 lines, then as 19 1/2 : 100 :: 36 : x. The nearest number in the table to this is 181, which shows that the weight of the ball will be rather more than 6lbs., or, in other words, that a rocket, the diameter or calibre of which is 36 lines, is a rocket of a 6lb. ball.

The composition of the powder for rockets must be different, according to the different sizes, it being completely ascertained that what is proper for small rockets would be too strong for the larger ones.

For rockets of one or two ounces, the composition should be one pound of gunpowder, and two ounces of finely ground soft charcoal.

For rockets of somewhat larger size, the composition may be ten ounces of gunpowder, three and a half of saltpetre, and three ounces of charcoal.

If the rockets be of five or six ounces weight, then to two pounds five ounces of gunpowder, add eight ounces of saltpetre, two ounces of sulphur, fix ounces of charcoal, and two ounces of iron filings.

If the rockets be from ten to twelve ounces, you may add to fixteen ounces of gunpowder, four ounces of saltpetre, three and a half of sulphur, and one of charcoal.

For rockets of a pound weight: to one pound of gunpowder add an ounce of sulphur, and three ounces of charcoal.

For rockets of from four to seven pounds: to thirty-one pounds of saltpetre, add four pounds and a half of sulphur, and ten of charcoal; and for those that are still larger, we may add to eight pounds of saltpetre, one pound four ounces of sulphur, and two pounds twelve ounces of charcoal. In all cases the ingredients are to be pounded separately, and finely sifted before they are used. Gunpowder, thus reduced from the corns in which it is manufactured, is called mahl-powder.

Matches.—The matches to let off rockets are thus made. Take linen, hemp, or cotton thread, and double it eight or ten times, if intended for large rockets, or only four or five times, if to be employed for flares. When the match is thus made, dip it in pure water, and being soaked, it is to be squeezed as dry as possible. Mix some gunpowder with a little water, so as to reduce it to a kind of paste, and immerse the match in it, turning and twisting it till it has imbibed a sufficient quantity of gunpowder; then sprinkle it over with dry powder, and when it is dry, it is fit for use.

In answer to the inquiry what causes rockets to ascend in the air, we may observe, that it is nearly the same as that which produces a recoil in fire-arms. Thus, when powder is inflamed in the chamber of a musket or cannon, it exerts its power against the breach of the piece, and against the bullet or wadding. But, the resistance opposed by the bullet being much less than that opposed by the mass of the barrel or cannon, the bullet is forced out with great velocity. The cause of the ascent of a rocket is nearly the same. At the moment when the powder begins to inflame, its expansion produces a torrent of elastic fluid, which acts in every direction, that is, against the air which opposes its escape from the cartridge, and against the upper part of the rocket; but the resistance of the air is more considerable than the weight of the rocket; therefore the rocket ascends by the exerts of the one of these forces over the other. This, however, would not be the case unless the rockets were pierced to a certain depth.

Brilliant Fire and Chinese Fire.—As iron-filings, when thrown into the fire, enflame and emit a strong light, this gave rise to the idea of rendering the fire of rockets much more brilliant, than when gunpowder, or the substances of which it is compounded, are alone employed. But the Chinese have long been in possession of a method of rendering this fire much more brilliant and variegated in its colours. It consists in the use of a very simple ingredient, namely, cast iron reduced to a powder more or less fine: the Chinese give it a name that answers to iron-fond in our language. It is prepared from old iron pots pulverized, till the grains are not larger than radish seed. Theh, however, are passed through sieves of different degrees of fineness; those that pass through the cloest sieve, are called sand of the first order;
order; those which pass through the next sieve in size, sand of the second order, and so on. This sand, when it inflames, emits an exceedingly vivid light, forming almost instantaneous luminous flowers and stars of various apparent magnitudes. It should be observed that rockets, into the composition of which iron-filings and iron-fand enter, cannot be long preferred, owing to their readiness in attracting the moisture which the saltpetre gives out. The following tables exhibit the proportions of the different ingredients for rockets of this kind of from 12 to 33 lbs.

**For Red Chinese Fire.**

<table>
<thead>
<tr>
<th>Calibers</th>
<th>Saltpetre</th>
<th>sulphur</th>
<th>Charcoal</th>
<th>Sand of the 1st Order.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds</td>
<td>Pounds</td>
<td>Ounces</td>
<td>Ounces</td>
<td>oz. dr.</td>
</tr>
<tr>
<td>12 to 15</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>7 o</td>
</tr>
<tr>
<td>18 - 21</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7 s</td>
</tr>
<tr>
<td>24 - 36</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>8 o</td>
</tr>
</tbody>
</table>

**For White Chinese Fire.**

<table>
<thead>
<tr>
<th>Calibers</th>
<th>Saltpetre</th>
<th>Mealed Gunpowder</th>
<th>Charcoal</th>
<th>Sand of the 2nd Order.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds</td>
<td>Pounds</td>
<td>Ounces</td>
<td>oz. dr.</td>
<td>oz. dr.</td>
</tr>
<tr>
<td>12 to 15</td>
<td>1</td>
<td>12</td>
<td>7</td>
<td>11 o</td>
</tr>
<tr>
<td>18 - 21</td>
<td>1</td>
<td>11</td>
<td>8</td>
<td>11 s</td>
</tr>
<tr>
<td>24 - 36</td>
<td>1</td>
<td>11</td>
<td>8</td>
<td>12 o</td>
</tr>
</tbody>
</table>

When these materials have been accurately weighed, the saltpetre and charcoal must be three times sifted through a hair sieve, in order to their being well mixed; the iron sand is then to be moistened with brandy to make the sulphur adhere, and then they are to be thoroughly incorporated.

The upper part of rockets is generally furnished with some composition, which takes fire when it has reached to its greatest height, emits a considerable blaze, or produces a loud report and whizzing noise. Of this kind are salpétres, maroons, stars, flowers of fire, &c. To make room for an artefact of this kind, the rocket is crowned with what is called a pot, which is larger than the rocket. (See fig. 3.) The following is the method of making this pot, and connecting it with the body of the rocket.

The mould for forming the pot, though of one piece, must consist of two cylindrical parts of different diameters. That on which the pot is rolled up must be three diameters of the rocket in length, and its diameter must be three fourths that of the rocket; the length of the other ought to be equal to two of these diameters, and its diameter to thirds that of the rocket. Having rolled the thick paper intended for making the pot, twice round the cylinder, a portion of it must be pinched in that part of the cylinder which has the least diameter: this part must be pared in such a manner, as to leave only what is necessary for making the pot fall to the top of the rocket, and the figure must be covered with paper.

To charge such a pot, attached to a rocket. Having pierced three or four holes in the double paper which covers the cavity of the rocket, pour over it a small quantity of the composition with which the rocket is filled, and by shaking it, make a part enter these holes; then arrange, in the pot, the composition with which it is to be charged, taking care not to introduce into it a quantity heavier than the body of the rocket. The whole must be secured by means of a few small balls of paper, to keep every thing in its place, and the pot must be covered with paper cemented to its edges: if a pointed summit be added to it, the rocket is fit for use.

**Serpents.**—These are small flying rockets, without rods, which, instead of rising in a perpendicular direction, mount obliquely, and descend in a zigzag form, without ascending to a great height. The composition of these is nearly the same as that of rockets, and the construction is as follows. The length, A C, (fig. 4.) of the cartridge is about four inches; it must be rolled on a stick somewhat larger than a goose-quill, and after being choked at one of its ends, it is filled beyond the middle, as to B, with the composition; then it is to be pinched so as to leave a small aperture. The remainder, B C, must be filled with grained powder, which will occasion a report when it bursts. Lastly, choke the cartridge entirely towards the extremity C; and at the other extremity, A, place a train of moist powder, to which, if fire be applied, it will be communicated to the composition in the part A B, and cause the whole to rise in the air. The serpent, as it falls, will make several turns in a zigzag direction, till the fire is communicated to the grained powder in the part B C; on which the serpent will burst with a loud report before it falls to the ground. The serpent cartridges are generally made of playing cards. These are rolled round a rod of iron or hard wood, and to confine the card a piece of strong paper is cemented over it. Larger serpents may be made by cementing two playing cards together, first moistened with water.

**Maroons.**—Small cubical boxes, filled with a composition proper for making them burst. To construct these, cut a piece of paletteboard according to the method taught in geometry to form the cube (see fig. 5.); join these squares at the edges, leaving one only to be cemented, and fill the cavity of the cube with grained powder; then cement strong paper in various directions over the body, and wrap round it two rows of packthread, dipped in strong glue; then make a hole in one of the corners, and introduce into it a match. If the maroons are to be luminous, that is, which are to give out a brilliant light before they burst, they must be covered with a paste, the composition of which will be noticed below under Stars, and then rolled in meal powder to serve as a match or communication.

Maroons differ from maroons only in form. The cartridges of the latter are round, and must be only four times their exterior diameter in length. They are choked at one end in the same manner as a rocket, and a pellet of paper is driven into the aperture which has been left, in order to fill it up. They are then charged with corn powder, above which is placed a ball of paper, gently pressed down to prevent the powder from being bruised; the second end of the maroon being now choked, the edges are to be pared on both sides, and the whole is covered with several turns of packthread, dipped in strong glue, and then left to dry.

**Stars.**—Small globes which emit a most brilliant light, so that, momentarily, they may be compared to the light of the stars in the heavens. These balls are not larger than a mullet-ball, and when put into rockets they must be wrapped up in tow, prepared for the purpose. The composition of these stars is as follows: To a pound of fine mealed gunpowder, add four pounds of saltpetre, and two pounds of sulphur. When these ingredients are thoroughly mixed, take a piece as large as a small nutmeg, and having wrapped
wrapped it in a linen rag, or paper, form it into a ball; then tie it closely round with packthread, and pierce a hole through the middle of it, large enough to receive a piece of prepared tow, which is to serve as a match. This, when lighted, will exhibit a most beautiful appearance; because the fire as it issuing from the two ends of the hole in the middle will extend to a great distance, and will make it seem very much larger than it actually is.

There are other compositions for flars; viz. with three ounces of faltpetre, mix one ounce of sulphur, and two drachms of mealed gunpowder; or with eight ounces of mealed powder, mix four ounces of sulphur, and the same quantity of faltpetre. When these materials have been well sifted, and sprinkled over with brandy, in which a small quantity of gum has been dissolved, the star is made in the following manner. Take a rocket mould eight or nine lines in diameter, and introduce into it a nipple, the piercer of which is of an uniform fize throughout, and equal in length to the height of the mould. Put into this mould a cartridge, and by means of a pierced rod load it with one of the preceding compositions; when loaded, take it from the mould, without removing the nipple, the piercer of which passes through the composition, and then cut the cartridge quite round into pieces of the thickness of three or four lines. The cartridge being thus cut, draw out the piercer gently, and the pieces which resemble the men employed for playing at drafts, pierced through the middle, will be flars, which must be filed on a match thread, that may be covered with tow. To give more brilliancy to flars of this kind, a cartridge thicker than that already described, and thinner than that of a flying rocket of the same fize, may be employed; but before it is cut in pieces, five or six holes must be pierced in the circumference of each piece to be cut. When the cartridge is cut, and the pieces have been filed, cement over the composition small bits of a card, each having a hole in the middle, so that these holes may correspond to the place where the composition is pierced.

Étoiles à Pot are made in the same way nearly as fuc-divions already described, only that it will not be necessary to cover them with packthread; it will be sufficient if they are pierced at one end, in order that flars may be fastened to them, constructed according to the first method, the composition of which is dry; for if the composition be in the form of paste, there will be no need to tie it. In this case, a little more of the paper must be left hollow at the end of the fucivion which has been pierced for the purpose of introducing the composition, and to place in the vacancy, towards the neck of the fucivion, some grained powder, which will communicate fire to the fucivion when the composition is consumed.

Shower of Fire.—To form this sort of fire-work, mould small paper cartridges on an iron-rod two lines and a half in diameter, and make them two inches and a half in length. They must not be cloaked, it being sufficient to twist the end of the cartridge, and having put the rod into it to beat it, in order to make it assume its proper form. When the cartridges are filled, which is done by immersing them in the composition, fold down the other end, and then apply a match. This will fill the surrounding air with an undulating fire. The following compositions are given as proper for flars of this kind.

Chinée Fire.—Mealed gunpowder one pound, sulphur two ounces, iron-fand of the firft order five ounces.

Ancient Fire.—Mealed gunpowder one pound, charcoal two ounces.

Brilliant Fire.—Mealed gunpowder one pound, iron-flings four ounces. The firft of these compositions is thought to be the most beautiful.

Sparks differ from flars only in their fize and duration, for they are made smaller than flars, and are confumed sooner. They are thus prepared. Having put into an earthen vessel an ounce of mealed gunpowder, two ounces of pulverized faltpetre, one ounce of liquid faltpetre, and four ounces of camphor reduced to powder, pour over this mixture some gum-water, or brandy in which gum has been dissolved, till the composition becomes of the confistence of thick fop. Then take fome lint which has been soaked in brandy, or in vinegar, or even in a folution of faltpetre, and being dried and unravelled, throw into the mixture such a quantity of it as is sufficient to absorb it entirely, taking care to flir it well. This composition may be formed into small balls about the fize of a pea, and being dried in the shade, and sprinkled with mealed powder, they will readily catch fire.

Sparks may be made by the following method: Take saw-dufl of fir, poplar, &c. and boil it in water in which faltpetre has been dissolved. When the water has boiled some time, it is to be poured off, that the saw-dufl may remain in the vessel. When nearly dry, it is to be spread out on a table, and sprinkled with sulphur sifted through a very fine sieve, to which may be added a little mealed powder.

Golden Rain.—Some flying rockets, which, as they fall, make small undulations in the air like frizzled hair, are called by the French writers fues cheveux, and by us bearded rockets; they finish with a kind of shower of fire, which is called golden rain, and they are constructed in the following manner. Fill the barrels of some goose-quills with the composition of flying rockets, and place upon the mouth of each a little moif gunpowder, both to keep in the composition, and to serve as a match. If a flying rocket be then loaded with these quills, they will produce at the end a beautiful shower of fire, which is denominated golden rain.

Coruntings, or Rockets that fly along a Rope.—A rocket may be made to run along an extended rope, by affixing to the rocket an empty cartridge, and introducing into it the rope which is to carry it along. Place the head of the rocket towards that fide to which you intend it to move; if it be then set fire to, it will run along the rope without flipping till the matter it contains is entirely exhausted. If the rocket is to move in a retrograde direction, fill one half of it with the composition, and cover it with a small round piece of wood, to serve as a partition between it, and that put into the other half; then make a hole below this partition, so as to correspond with a small canal filled with braided powder, and terminating at the other end of the rocket. By these means the fire, when it ceases in the first half of the rocket, will be communicated through the hole into the small canal, which will convey it to the other end, and this end being then kindled, the rocket will move backwards, and return to the place from whence it set out.

Two rockets of equal fize, bound together by strong packthread, and so arranged that the head of the one shall be opposite to the neck of the other, in order that when the fire has consumed the composition in the one, it may be communicated to that in the other, and oblige both of them to move in a retrograde direction, may likewise be adjusted to the rope by means of a piece of hollow reed. Rockets of this kind are generally employed for letting fire to various other pieces when large fire-works are exhibited; and to render
render them more striking, they are made in the form of different animals, such as serpents, dragons, &c.

To give a rocket a kind of rotatory motion around the rope along which it advances, it will be sufficient to tie to it another rocket, placed in a transversal direction. But if the aperture of the latter, instead of being at the bottom, ought to be in the side, near one of the ends. If both rockets be fired at the same time, the latter will make the other revolve around the rope, while it advances along it.

Rockets which burn in the Water.—In these there must be a considerable variation in the construction of the models, and also in the materials of which they are composed. The mould may be eight or nine inches in length, and an inch in diameter: the former, on which the cartridge is rolled up, may be nine lines in thickness. The composition should consist of three materials mixed together, viz. three ounces of mealed powder, one pound of saltpetre, and eight ounces of sulphur. If the rocket is to appear on the water with a beautiful tail, the composition must consist of eight ounces of gunpowder, one pound of saltpetre, eight ounces of pounded and finely fitted sulphur, and two ounces of charcoal. When the composition has been prepared according to these proportions, and the rocket has been filled in the manner above described, apply a faculton to the end of it, and having covered the rocket with wax, pitch, &c. attach to it a small rod of white willow, about two feet in length, that the rocket may conveniently float. If it be required that these rockets should plunge down, and again rise up, a certain quantity of mealed gunpowder, without any mixture, must be introduced into them, at certain distances.

A rocket which is fired in the water, and, after burning there half the time of its duration, mounts into the air with great velocity, may be thus constructed. Take a flying rocket, furnished with a rod, and by means of a little glue attach it to a water-rocket, but only at the middle, A (fig. 6.) in such a manner that the latter shall have its neck uppermost, and the other its neck downward. Adjut to their extremity, B, a small tube, to communicate the fire from the one to the other, and cover both with a coating of pitch, wax, &c. that they may not be damaged by the water. Then attach to the flying rocket, after it has been thus cemented to the aquatic one, a rod, as D, and from F suspend a piece of packthread, to support a musket bullet E, made falt to the rod by means of a needle or piece of iron wire. When these arrangements have been made, fire to the part C after the rocket is in the water; and when the composition is consumed to B, the fire will be communicated through the small tube to the other rocket; the latter will then rise and leave the other, which will not be able to follow it, on account of the weight adhering to it.

Globes and Fire-Balls are made in different forms, viz. spherical, spheroidal, or cylindrical. The spherical are made in the following manner. Construct a hollow wooden globe of any size at pleasure, and very round both within and without, so that its thickness, A C or B D, (fig. 7.) may be about the ninth part of its diameter A B, and having an aperture, L M or O N, equal to the thicknesses A C or B D, that is, to the ninth part of the diameter A B. It is through this aperture, that fire is communicated to the globe, when it has been filled with the proper composition, through the lower aperture I K. A petard of metal, loaded with good grained powder, is to be introduced also through the lower aperture, and to be placed horizontally. The aperture I K, which is nearly equal to the thickness, E F or G H, of the cylinder E F G H, is to be closed by means of a wooden tompon dipped in warm pitch; and melt over it such a quantity of lead that its weight may cause the globe to sink in water, till nothing remain above it but the part G H; which will be the cale if the weight of the lead, with that of the globe and the composition, be equal to the weight of an equal volume of water. If the globe be then placed in the water, the lead, by its gravity, will keep the aperture, I K, directly downwards, and the cylinder, E F G H, in a perpendicular direction, to which fire must have been previously applied. The composition with which the globe must be filled, is as follows: to a pound of corned powder, add thirty-two pounds of saltpetre, eight pounds of sulphur, one third of scraped ivory, and eight pounds of sawdust previously boiled in a solution of saltpetre, and dried in the open air.

Globes which leap or roll on the Ground.—Having constructed a wooden globe, A, (fig. 8.) with a cylinder C, similar to the one just described, and having loaded it with the same composition, introduce into it four or even more petards, loaded with good corned powder to their orifices, as is shewn at A B, which must be well fopped with paper or tow. If a globe, prepared in this manner, be fired by means of a match at C, it will leap about as it burns, on a smooth horizontal plane, according as the petards are set on fire. The petards may be affixed to the exterior surface of the globe, as is seen in the figure, which they will cause to roll and leap as they catch fire.

Aerial Globes, called Bombs.—These globes are called aerials, because they are thrown into the air from a mortar. Though they are of wood, and have a suitable thickness, yet they are liable to burst unless the charge be nicely proportioned to their strength. The usual quantity is an ounce of powder for a globe of four pounds weight; two ounces for one of eight, and so on. As the chamber of the mortar may be too large to contain the exact quantity of powder sufficient for the fire-ball, which ought to be placed immediately above the powder, in order that it may be expelled and set on fire at the same time, another mortar may be constructed of wood, or of palse-board with a wooden bottom, which may be put into the large iron mortar, to be loaded with a quantity of powder proportioned to the weight of the globe. This small mortar must be of light wood, or of paper pasted together, and rolled up in the form of a cylinder, but the bottom must be of wood. The chamber for the powder must be pierced obliquely, so that the aperture may correspond to the aperture of the metal mortar, then the fire applied to the latter may be communicated to the powder which is at the bottom of the chamber, immediately below the globe.

The globe must be filled with several pieces of reed or cane, or common reed equal in length to the interior height of the globe, and charged with a slow composition, made of three ounces of mealed gunpowder, an ounce of sulphur moistened with a small quantity of petroleum oil, and two ounces of charcoal; and in order that these reeds or canes may catch fire the sooner, and with more facility, they must be charged at the lower ends, which rest on the bottom of the globe, with pulverized gunpowder moistened with petroleum oil or brandy, and then dried. The bottom of the globe ought to be covered with gunpowder, partly mealed and partly corned, which, when set on fire, will communicate the fire to the lower part of the reed. In stead of reeds, the globe may be charged with running rockets, or paper petards, and a quantity of fiery flars or sparkes mixed with mealed powder, placed above these petards, which must be choked at unequal heights, that they may produce their effect at different times.

Jets of Fire are a sort of fixed rockets, the effect of which is to throw up into the air jets of fire similar to jets of water. N They
They serve also to represent cascades, for if a series of such rockets be placed horizontally on the same line, it may be easily seen that the fire which they emit will resemble a fleet of water. When arranged in a circular form, like the radii of a circle, they form what is called a fixed fun. To form jets of this kind, the cartridge for brilliant fires must, in thickness, be equal to a fourth part of the diameter, and for Chinese fire only a sixth part. The cartridge is loaded on a nipple, having a point equal in length to the same diameter, and in thickness to a fourth part of it; but as it generally happens that the mouth of the jet becomes larger than is necessary for the effect of the fire, the cartridge must be filled equal to a fourth part of the diameter with clay, which must be rammed down. This will make the jet ascend much higher. When the charge is completed with the proper composition, the cartridge must be closed with a tomption of wood, above which it must be chocked. Jets intended for representing fleets of fire ought not to be chocked. They must be placed in a horizontal position, or inclined a little downwards. The following are the principal compositions for jets of fire.

1. For Jets of half an Inch or less in Diameter.—Chinese fire: Saltpetre and mealed powder 1 lb. each; fulphur 8 ounces; charcoal 2 ounces. White fire: Saltpetre 1 lb.; mealed powder 8 ounces; fulphur 3 ounces; charcoal 2 ounces; iron-land of the first order 8 ounces.

2. For Jets of an Inch or less in Diameter.—Brilliant fire: Mealed powder 1 lb., iron-flings 5 ounces. White fire: Saltpetre and mealed powder 1 lb. each; fulphur 8 ounces; charcoal 2 ounces. Chinese fire: Saltpetre 16 ounces; fulphur 5 ounces; charcoal 5 ounces; iron-land of the third order 12 ounces.

3. For Jets of 15 or 18 Lines in Diameter.—Chinese fire: Saltpetre 16 ounces; fulphur 7 ounces; charcoal 5 ounces; of the several different kinds of iron-land mixed 12 ounces.

Fires of different Colours.—For white fire the gunpowder must be mixed with iron or rather fleel-flings; for red fire, iron-land of the first order must be employed in the same way. Camphor mixed with the usual composition is said to make the flame appear of a pale white colour. Rainplings of ivory give a clear flame of a silver colour.

Page for representing Animals, &c. in Fire.—Take sulphur reduced to a very fine powder, and having formed it into a paste with starch, cover it with the figure of the thing to be represented, having first coated it with clay to prevent it from being burnt. After the figure is covered with the paste, it must be sprinkled, while moist, with gunpowder; and when the whole is perfectly dry, arrange about it several small matches, that the fire may be speedily communicated to it on all sides. In this way all sorts of garlands, felloons, and other ornaments, may be imitated by fire of different colours.

Suns, fixed and moveable.—For fixed funs, let a round piece of wood be cut, into the circumference of which are to be screwed twelve or fifteen pieces in the form of radii, to which are to be attached jets of fire, of the composition described above; so that they may appear as radii tending to the same centre, the mouth of the jet being towards the circumference. Apply a match in such a manner that the fire communicated at the centre, may be conveyed at the same time to the mouth of each of the jets, by which means, each throwing out its fire, there will be produced the appearance of a radiating fun. If a gun be fired with the wheel in a position perpendicular to the horizon. The rockets or jets may be so arranged as to cros each other in an angular manner, in which case, instead of a fun, you will have a star, or a cros. Some of these funs are made also with several rows of jets, which are called glories. For revolving funs, provide a wooden wheel, and attach to the circumference fire-jets placed in the direction of the circumference; they must not be chocked at the bottom, and ought to be arranged in such a manner, that the mouth of the one shall be near the bottom of the other, so that when the fire of the one is ended, it may immediately proceed to another. When the fire is applied to one of these jets, the recoil of the rocket will make the wheel turn round, and if is too large and ponderous. For this reason, when these funs are of a considerable size, that is, when they consist of perhaps twenty rockets, fire must be communicated at the same time to the first, the sixth, eleventh, and sixteenth, from which it will proceed to the second, the seventh, the twelfth, the seventeenth, and so on. These four rockets will make the wheel turn round with great rapidity. If two similar funs be placed one behind the other, and are made to turn in a contrary direction, they will produce a fine effect of crosset-fire.

Making, loading, and firing Pota des Brins.—These are made of paste-board, and must be rolled pretty thick; usually made three or four inches in diameter, and four diameters long, and pinched with a neck at one end, like common cafes. A number of these are placed on a plank thus: having fixed on a plank two rows of wooden pegs, cut in the bottom of the plank a groove the whole length under each row of pegs; then, through the centre of each peg, bore a hole down to the groove at bottom, and on every peg fix and glue a pot, whose mouth must fit tight on the peg; through all the holes run a quick-match, one end of which must go into the pot, and the other into the groove, which must have a match laid in it from end to end, and covered with paper, so that, when lighted at one end, it may discharge the whole almost instantaneously; in all the pots put about one ounce of meal and corn powder; then in some put flars, and others rains, fikes, perfents, crackers, &c; when they are all loaded, paste paper over their mouths. Two or three hundred of these pots being fired together, make a very pretty show, by affording so great a variety of fires. Fig. 9 is a range of pots des brins, with the leader A, by which they are fired.

Caduceus Rockets, in rising, form two spiral lines, or double worm, by reason of being placed obliquely, one opposite the other; and their counterpoise is in their centre, which causes them to rise in a vertical direction. Rockets for this purpose must have their ends chocked close, without either head or bounce, for a weight at top would be a great obstruction to their mounting; though they have been known sometimes to be bounced, but then they did not rise so high as those that were not; nor do any caduceus rockets ascend so high as single, because of their comet-like motion, and likewise the resistence of air, which is much greater than two rockets of the same size would meet with, if fired singly. By fig. 10 we see the method of fixing these rockets; the sticks for this purpose must have all their sides equal, which sides should be equal to the breadth of a stick proper for a fly-rocket of the same weight as those we intend to use, and to taper downwards as usual, long enough to balance them, one length of a rocket, from the crofs stick, which must be placed from the large stick, fix diameters of one of the rockets, and its length seven diameters; so that each rocket, when tied on, may form with the large stick an angle of sixty degrees. In laying on the rockets, place their heads on the opposite sides of the crofs stick, and their ends on the opposite sides of the long stick; then carry a leader from the mouth of one into that of the other. When these rockets are to be fired, suspend them between two hooks or nails,
PYROTECHNY.

nails, then burn the leader through the middle, and both will take fire at the same time. Rockets of one pound are a good size for this use.

Illuminated Spiral Wheel.—First have a circular horizontal wheel, made two feet in diameter, with a hole quite through the nave; then take three thin pieces of deal, three feet long each, and three quarters of an inch broad each: one end of each of these pieces nail to the fell of the wheel, at an equal distance from one another, and the other end nail to a block with a hole in its bottom, which must be perpendicular with that in the block of the wheel, but not so large. The wheel being thus made, take a hoop planed down very thin and flat; then nail one end of it to the fell of the wheel, and wind it round the three sticks in a spiral line, from the wheel to the block at top: on the top of this block fix a cafe of Chinese fire; on the wheel you may place any number of cafes, which must incline downwards, and burn two at a time. If the wheel should consist of ten cafes, you may let the illuminations and Chinese fire begin with the second cafes. The spindle for this wheel must be a little longer than the cone, and made very smooth at top, on which the upper end of the wheel to rest. See fig. 11.

Fromant Wheels.—First take a nave, made nine inches long, and three in diameter; near the bottom of this nave fix eight spokes, with a hole in the end of each, large enough to receive a two or four-ounce cafe: each of these spokes may be fourteen inches long from the block. Near the top of this block fix eight more of the same spokes, exactly over the others, but not so long by two inches. As this wheel is to run horizontally, all the cafes in the spokes at top must play obliquely upwards, and all of them in the spokes at bottom obliquely downwards. This being done, take a small horizontal wheel, made with eight spokes, each five inches long from the block; on the top of this wheel place a cafe of brilliant fire: all the cafes on this wheel must play in an oblique direction downwards, and burn two at a time, and those on the large wheel four at a time; that is, two of those in the top set of spokes, and two of them in the bottom set of spokes. The four first cafes on the large wheel, and the two first on the small, must be fired at the same time, and the brilliant fire at top, at the beginning of the last cafes. The cafes of the wheels may be filled with a grey charge. When these wheels are completed, you must have a strong iron spindle, made four feet fixed inches long, and fixed perpendicular on the top of a stand: on this put the large wheel, whose nave must have a hole quite through, from the bottom to the top. This hole must be large enough to turn easy round the bottom of the spindle, at which place there must be a shoulder, to keep the wheel from touching the stand: at the top of the spindle put the small wheel, and join it to a large one with a leader, in order to fire them both together.

Illuminated Globes, with horizontal Wheels.—The hoops for these globes may be made of wood, tin, or iron wire, about two feet in diameter. For a single globe take two hoops, and tie them together, one within the other, at right angles; then have a horizontal wheel made, whose diameter must be a little wider than the globe, and its nave fixed inches long, on the top of which the globe is fixed, so as to stand three or four inches from the wheel: on this wheel you may put any number of cafes, filled with what charge you like; but let two of them burn at a time: they may be placed horizontally, or to incline downwards, just as you choose. Now, when the wheel is clothed, fix on the hoops as many illuminations as will stand within two inches and a half of each other: these you fasten on the hoops with small iron binding wire; and when they are all on, put on your pipes of communication, which must be so managed as to light them all with the second or third cafe on the wheel. The spindle on which the globe is to run must go through the block of the wheel, up to the inside of the top of the globe, where must be fixed a bit of brass or iron, with a hole in it, to receive the point of the spindle, on which the whole weight of the wheel is to bear, as in fig. 12, which represents a globe on its spindle. By this method may be made a crown, which is done by having the hoops bent in the form of a crown. Sometimes globes and crowns are ordered so as to stand still, and the wheel only to turn round; but when you would have the globe or crown to stand still, and the wheel to run by itself, the block of the wheel must not be so long, nor the spindle any longer, than to just raise the globe a little above the wheel, and the wheel cafes and illumination must begin together.

Dodecahedron, so called because it nearly represents a twelve-sided figure, and is made thus. First take a ball, turned out of some hard wood, fourteen inches in diameter: when done, divide its surface into fourteen equal parts, from which bore holes an inch and a half in diameter perpendicular to the centre, so that they may all meet in the middle: then let there be turned in the inside of each hole a female screw; and to all the holes, but one, must be made a round spoke, five feet long, with four inches of the screw at one end, to fit the holes; then in the screw end of all the spokes bore a hole, five inches up, which must be bored planting, so as to come out at one side, a little above the screw; from which cut a small groove along the spoke, within six inches of the other end, where you make another hole through to the other side of the spoke: in this end fix a spindle, on which put a small wheel, of three or four sides, each side fixed or seven inches long: these sides must have grooves cut in them, large enough to receive a two or four-ounce cafe: when these wheels are clothed, put them on the spindles, and at the end of each spindle put a nut, to keep the wheel from falling off: the wheels being thus fixed, carry a pipe from the mouth of the first cafe on each wheel, through the hole in the side of the spoke, and from thence along the groove, and through the other hole, so as to hang out at the screw end about an inch. The spokes being all prepared in this manner, you must have a paper, on which you intend to fire the work, with an iron screw in the top of it, to fit one of the holes in the ball: on this screw fix the ball; then in the top hole of the ball put a little meal powder, and some loose quick-match; then screw in all the spokes, and in one side of the ball bore a hole, in which put a leader, and secure it at the end; and your work will be ready to be fired. By this leader the powder and match in the centre are fired, which will light the match at the ends of the spokes all at once, whereby all the wheels will be lighted at once. There may be an addition to this piece, by fixing a small globe on each wheel, or one on the top wheel only. A grey charge will be proper for the wheel-cafes.

Tree of brilliant Fire, is represented by fig. 13, as it appears when burning. First, let A be upright piece of wood, four feet long, two inches broad, and one thick: at top of this piece, on the flat side, fix a hoop, fourteen inches in diameter; and round its edge and front place illuminations, and in the centre a five-pointed star; then at E, which is one foot and a half from the edge of the hoop, place two cafes of brilliant fire, one on each side: these cafes should be one foot long each: below these fix two more cafes of the same size, and at such a distance, that their mouths may almost meet them at top; then, close to the ends of these cafes, fix two more of the same cafes; they must stand parallel.
rallied to them at E. The cates being thus fixed, clothe them with leaders, so that they, with the illuminations and stars at top, may all take fire together.

Illuminated Trew-tree.—First have a tree made of wood, such as is shewn by fig. 14. The middle piece, or stem, on which the branches are fixed, must be eight feet six inches high: at the bottom of this piece draw a line, at right angles, two feet six inches long at each side; then from L., which is one foot six inches from the bottom, draw a line on each side to C and D; these lines will give the length of the two first branches. Then put on the two top branches parallel to them at bottom; let the length of each of these branches be one foot from the stem: from the ends of these two branches draw a line to C and D; then fix on five more branches at an equal distance from each other, and their length will be determined by the lines A C and E D. When the branches are fixed, place illuminating port-fires on the top of each, as many as you choose: behind the top of the stem fallen a gerbe, or white fountain, which must be fired at the beginning of the illuminations on the tree.

Illuminated Seven Stars.—Let fig. 15. be a smooth circular board, six feet diameter; out of the midst of it cut a circular piece twelve or fourteen inches diameter, and over the vacancy put white Perlian silk, on which paint a moon’s face; then let I, I, I, &c. be flares each four or five inches in diameter, cut out with five points, and covered with oiled silk: on the front of the large circular board draw a seven pointed star, as large as the circle will allow; then on the lines which form this star bore holes, wherein fix pointed flars. When this piece is to be fired, it must be fixd upon the front of a post, on a spindle, with a wheel of brilliant fire behind the face of the moon; so that while the wheel burns, the moon and flars will appear transparent, and when the wheel has burnt out, they will disappear, and the large star in front, which is formed of flars, will begin, being lighted by a pipe of communication from the last cafe of the vertical wheel, behind the moon: this pipe must be managed in the same manner as those in regulated pieces.

Pin Wheels.—First roll some paper pipes, about fourteen inches long each; these pipes must not be made thick of paper, two or three rounds of elephant paper being sufficient. When your pipes are thoroughly dried, you must have made a tin tube, twelve inches long, to fit easily into the pipes: at one end of this tube fix a small conical cup, which done is called a funnel; then bend one end of one of the pipes, and put the funnel in at the other, as far as it will reach, and fill the cup with composition; then draw out the funnel by a little at a time, shaking it up and down, and it will fill the pipe as it comes out. Having filled some pipes, and made some small blocks, about an inch in diameter, and half an inch thick; round one of these blocks wind and paste a pipe, and to the end of this pipe join another; which must be done by twisting the end of one pipe to a point, and putting it into the end of the other, with a little paste; in this manner join four or five pipes, winding them one upon the other, so as to form a spiral line. Having wound your pipes, paste two slips of paper across them, to hold them together; besides these slips of paper the pipes must be paled together.

There is another method of making these wheels, called the French, which is, by winding on the pipe without paste, and flocking them together with sealing wax, at every half-turn; so that, when they are fired, the end will fall loose every time the fire paves the wax; by which means the circle of fire will be considerably increased. The forners for these pipes are made from one-half to four-fourteenths of an inch diameter, and the composition for them as follows: meal powder eight ounces, salt petre two ounces, and sulphur one; among those ingredients may be mixed a little fillet-filings, or the dust of cast-iron; this composition should be very dry, and not made too fine, or it will stick in the funnel. These wheels may be fired on a large pin, and held in the hand with safety.

Placing Fire-works to be exhibited, with the Order of Firing. Nothing adds more to the appearance of fire-works, than the placing them properly; though the manner of placing them chiefly depends on the judgment of the maker. We shall give such rules here, as have been generally observed; for example, whether your works are to be fired on a building, or on flands. If they are a double set, place one wheel of a fort on each side of the building: and next to each of them, towards the centre, place a fixed piece, then wheels, and so on, leaving a sufficient distance between them, for the fire to play from one without burning the other. Having fixed some of your works thus in front, place the rest behind them, in the centre of their intervals; the largest piece, which is generally a regulated or transparent piece, must be placed in the centre of the building, and behind it a fun, which must always stand above all the other works: a little before the building, or flands, place your large gerbes; and at the back of the works, fix your maroon batteries, pots des aigrettes, pots des brins, pots des fau- cions, air-baloons, and flights of rockets: the rockets may be fixed behind, or any where else, so as not to be in the way of the works.

Single collections are fired on flands, which flands are made in the same manner as healdole flands, only the top part must be long or short occasionally: these flands may be fixed up very soon without much trouble. Having given sufficient instructions for placing of fire-works, we shall proceed with the manner of firing them.

Order of Firing.

1. Two signal rockets.
2. Six sky rockets.
3. Two honorary rockets.
4. Four caduceus.
5. Two vertical wheels illuminated.
6. Two spiral wheels illuminated.
7. Transparent flars.
8. A line rocket of five changes.
11. Air-balloons illuminated.
13. Regulating pieces of four mutations each.
15. Three large gerbes.
16. A flight of rockets.
17. Two balloon wheels.
18. Cascades of brilliant fire.
19. Twelve sky-rockets.
20. Two illuminated yew-trees.
22. Four tourbillons.
23. Two fruilloni wheels.
24. Illuminated globes with horizontal wheels.
25. One pot des faucions.
26. Two plural wheels.
27. Maroon battery.
28. Two chandlers illuminated.
29. Range of pots des brins.
30. Twelve sky-rockets.
31. Two yew-trees of fire.
32. Neil
32. Neat of serpents.
33. Two double cones illuminated.
34. Regulating piece of seven mutations, viz.
   1. Vertical wheel illuminated.
   2. Golden glory.
   3. Octagon vertical wheel.
   4. Porcupine's quills.
   5. Cross fires.
   7. Six vertical wheels.
35. Brilliant fun.
36. Large flight of rockets.

When water-works are to be exhibited, divide them into several sets, and fire one set after every fifth or sixth change of hand and air-works. Observe this rule in firing a double set of works; always to begin with sky-rockets, then two moveable pieces, then two fixed pieces, and so on; ending with a large flight of rockets, or a maroon battery; if a single collection, fire a fixed piece after every wheel or two, and now and then some air and water-works. Jones's Fireworks, liv. 1776.

PYROTECHNICAL SPONGE. See SPONGE.

PYROTICS, πυροτικ ος, formed from πυρ, fire, in Medicine, caustics, or remedies, either actually or potentially hot; and which, accordingly, will burn the flesh, and raise an eschar.

PYROUET. See PIROUETTE.

PYROXENE, in Mineralogy. See Augite and Lava.

According to Hauy, the mineral called augite by Werner is the black or greenish-black variety of pyroxene found in volcanic countries and in basalt. The primitive form of the crystals of pyroxene is an oblique rhombohedral prism.

The greenish-transparent pyroxene, with the forms of the crystals distinctly marked, from the department of the Po, is the alabite of Bouvoisin. Journal des Mines, N° 115.

The greenish-grey, or whitish-grey variety, the primitive crystals of which are indistinct, from the same department, were called by Bouvoisin maffite. Both these varieties have been called by some mineralogists dioptide.

The greenish-grey and obscure green periclostahedral variety of pyroxene, is the folialte of Werner, called also malacolithe by Haüy. The mineral called coccipite, discovered by Dandridge at the iron mines of Sudermannland and Nierke, in Sweden, and Arendahl in Norway, is also brought under the species pyroxene by Haüy. Tableau Comparatif.

By reducing many varieties of minerals under one species, Hauy may be considered as having rendered an additional service to mineralogy, already too much loaded with pedantic or unmeaning terms; but the term pyroxene itself may be justly objected to, as being founded not on any distinct character, but on the hypothetical assumption that these crystals are foreign to the igneous products in which they are imbedded, an assumption for which there does not appear sufficient proof. The constituent parts of pyroxene, its specific gravity and hardness, to nearly agree with those of basaltic hornblende, that these substances ought perhaps to be classed as varieties of the same species, without regarding the small difference of their crystalline forms. See Hornblende.

PYROXENE en Roches, or Rock Pyroxene. In the Journal des Mines, Nov. 1812, a description is given of entire rocks composed of pyroxene, discovered by J. Charpentier in the Pyrenees. The fusibility is homogenous, of a texture commonly granularly lamellar, which in some pieces becomes floaty. Its most common colour is green of various shades, from the olive-green to an emerald green, sometimes cloudy but often clear. From a greenish-grey it passes to a reddish-brown and ochre yellow. It is amorphous. The

lullure is iplephant. Its fracture is lamellar, and has a two-fold cleavage equally perfect, crossing at an angle of about 92°. In other directions the fracture is either imperfectly lamellar or euhedral. It scratches glass, and gives some spark with steel. It melts with great difficulty by the blowpipe, but with borax it easily forms a green glass.

M. Vogel has analysed this mineral, and discovered chrome in the green specimen. From the detailed description of this rock, it appears nearly allied to schistose, fiper, and ferpernite. It is frequently intimately combined with tale, in which it is not easy to distinguish it from ferpernite. Rock pyroxene is found in beds in the primitive limestone, that forms vast mountains superincumbent on granite, extending from the valley of Vicedello, in the department of Arriege, to St. Beat, in the valley of Garonne. The masses of rock pyroxene are of extraordinary size, extending in length 5000 toises. Its thickness is difficult to determine, but is supposed to exceed 300 toises. Charpentier is disposed to class rock pyroxene as an intermediate rock between hornblende and ferpernite, and subordinately to primitive limestone. It neither contains foreign beds nor mineral salts; and is less liable to decomposition when pure, than almost any other rock. When intermixed with tale it decomposes rapidly.

PYRRHA, in Ancient Geography, a town of the island of Lesbos, between the promontory Sigrium and the town of Erethus, according to Ptolemy. The town took its name from a strait between Asia Minor and the island of Lesbos, and gave it to a river in the same island.—Allo, a town of Macedonia, in Magnesia. Pliny.—Allo, a town of Asia Minor, in Lybia. Pliny.—Allo, a town of Asia Minor, in Ionia, situated at the entrance of the northern part of the Latnic gulf, E. N. E. of the town of Miletus, and S. S. E. of that of Myus. Strabo places it at 100 stadia from Heraclea.—Allo, a promontory of Thessaly, upon the coast of the Phthiothide. Strabo says, that before this promontory were two isles; one called Pyrrha, and the other Deucalon.—Allo, a town of Greece, in the Phocide. Pliny.—Allo, a town situated in the vicinity of the Palus-Maeotis; submerged according to the relation of Pliny.—Allo, a town of Asia Minor, in Caria.

PYRRHICHA, πυρριχετος, in Antiquity, a kind of exercise on horseback; or a feigned combat, for the exercise of the cavalry.

It was thus called from its inventor Pyrrhus, or Pyrrhus, in Cydoria, who first taught the Cretans to march in measure and cadence to battle, and to obverse the pace of the Pyrrhic foot. Others derive the name from Pyrrhus, son of Achilles, who instituted this exercise at the obsequies of his father. Arisotole says, that it was Achilles himself who invented it.

The Romans also called it ludus Trojanus, the Trojan game; and Aulus Gallius decursus. It is doubtless this exercise, that we see represented on medals, by two cavaliers in front, running with lances, and the word decursus in the exergum.

PYRRHICHIUS, πυρριχετος, in the Greek and Latin Poetry, a foot consisting of two syllables, both short; as demus.

Among the ancients this foot is also called periantus; by others hegemon.

PYRRHICUS, in Ancient Geography, a town of Lacoia, upon the stream of Scryaxis, S. of Hypus. Here were two temples, one of Diana Altraeia, and another of the Amazonian Apollo. The statues of these deities were of wood, and it is supposed they were placed here, by the Amazons themselves.

PYRRHO. See PYRRHIONIANs.
PYRHOCORAX, in Ornithology, a species of Corvus (which fee), the Alpine crow of Latham, and the Choucas des Alpes of Buffon. Also, the Monedula, Coracias of Aldrovand, &c., Cornish crows, red-legged crow of Pennant and Latham, and Corvus Gracula, which see.

PYRRHONIANS, Pyrrhoniens, or Pyrrhonists, a sect of ancient philosophers, so called from their founder Pyrrho, a Greek philosopher, born at Elea, in Peloponnesus, who in early life studied painting, but aspiring to philosophical pursuits he became a disciple of Anaxarchus, and accompanied him as far as India. In this journey he followed Alexander the Great; and hence we may know in what time he flourished. In India he converted with the Brachmans and Gymnosophists, imbibing from their doctrine whatever might seem favourable to his natural disposition towards doubting; a disposition which was cherished by his master, who had formerly been a disciple of a sceptical philosopher, Metrodorus of Chios. As he was involved in fresh uncertainty by every advance he made in the study of philosophy, he left the school of the Dogmatists, who professed to be poiffessed of certain knowledge, and established a new school, in which he taught, that every object of human inquiry is involved in uncertainty, so that it is impossible ever to arrive at the knowledge of truth.

The distinguishing character of this philosopher was, that he professed to doubt of every thing, maintaining that men only judge of truth and falsehood from appearances, which deceive. On this principle he kept himself in continual suspension of mind, never determining on any thing; to avoid the inconveniences of error and false judgments. He found in all things (says Bayle) reasons to affirm and to deny; and therefore he suspended his affections after he had well examined the arguments pro et con, and reduced all his conclusions to a non liquet, let the matter be farther enquired into. Hence it is (says he) that he fought truth as long as he lived, but he so contrived the matter, as never to grant that he had found it. Though he is not the inventor of that method of philosophizing, yet it goes by his name.

The art of disputing about every thing, without doing any thing else but suspending one’s judgment, is called Pyrrhonism, or Scepticism.

Some have said, that this philosopher acted upon his own principles, and carried his scepticism to an extreme so ridiculous, that his friends were obliged to accompany him wherever he went, that he might not be run over by carriages, or fall down precipices. These reports, however, are inconsistent with the respect that is paid to him by ancient writers, and with the general history of his life, and are charged, as calumnies, upon the Dogmatists, whom he opposed. A great part of his life was spent in solitude; and he always preferred a settled composure of countenance, undisturbed by fear, or joy, or grief. He endured bodily pain with great fortitude; and in the midst of dangers he manifested no signs of apprehension. As a disputant, he was celebrated for the subtility of his arguments, and the perspicacity of his language. So highly was Pyrrho esteemed by his countrymen, that they honored him with the office of chief priest, and from respect to him, passed a decree by which all philosophers were indulged with an exemption from public taxes. Of the poets, and particularly of Homer, he was a great admirer; and frequently repeated passages from his poems. He flourished about the 110th olympiad, and died about the 90th year of his age, probably in the 123d olympiad, B.C. 288. After his death, the Athenians honored his memory with a statue; and a monument, as Lucretius informs us, was erected to him in his own country. His scepticism may in a great measure be ascribed to his early acquaintance with the system of Democritus. Having learned from this philosopher to deny the real existence of all qualities in bodies, except those that are essential to primary atoms, and to refer every thing else to the perceptions of the mind produced by external objects, that is, to appearance and opinion, he concluded, that all knowledge depended upon the fallacious report of the senses, and consequently, that there can be no such thing as certainty. In this notion he was encouraged by the general spirit of the Eleatic school, in which he was educated, which was unfavourable to science. But his scepticism was more confirmed by the subtleties of the Dialectic school, in which he was instructed by Bryton, the son of Stilpo. Regarding mental tranquillity as the great end of all philosophy, and observing that nothing contributed so much to disturb it, as the dilemmas which agitated the schools of the Dogmatists, and also inferring from their endless disputes the uncertainty of the questions which they debated, he had recourse to the doctrine of universal uncertainty; and thus it happened in his cafe, as in that of many others, that controversy became the parent of scepticism.

Pyrrho had several disciples, but none who merit particular notice except Timon, the Phliasian, who lived to the age of 90 years, and flourished in the time of Ptolemy Philadelphus. The public succession of professors in the Pyrrhonian school terminated with Timon, and in Cicero’s time this school was extinct. The disciples of Timon chose to screen their scepticism under the authority of the Academy; and after some interval, the school itself was revived by Ptolemaeus, a Cyrenian, and continued at Alexandria by Enepodemus, a contemporary with Cicero: the latter wrote a treatise “On the Principles of the Pyrrhonian Philosophy,” the heads of which are preferred by Photius. From his time it was transmitted, through a series of preceptors little known, to Sextus Empiricus, who has given a summary of the sceptical doctrine; for an account of which, see Sceptics. As for Pyrrho and his followers, they rather endeavoured to demolish every other philosophical structure, than to erect one of their own. They affected nothing; but professed positions merely in the way of enunciation, without attempting to determine on which side, in any disputed question, the truth lay, or even presuming to affirm, that one proposition was more probable than another.

Thus, the Pyrrhonians, or Sceptics, are persons who, from the great number of things that are dark and obscure, and from the aversion they bear to popular credulity, maintain, that there is nothing certain in the world.

The truth is, Pyrrhonism has some foundation in nature: we do not judge of things from their real essences, but from their relations to ourselves. Most of our ideas we receive by means of our senses; but our senses are not given us to judge of the essences, but of the relations of things to themselves; i.e., how they may affect us as to do us good or harm.

Thus, o. e., our eyes do not give us the real magnitudes of objects, but their relative ones only.

The Academicians differed from the Pyrrhonians, in that they owned there were some things more like or more near akin to truth than others, which the Pyrrhonians peremptorily denied. On account of the similarity of the opinions of this sect and those of the Platonic school in the Middle and New Academy, it happened, that many of the real followers of Pyrrho chose to screen themselves from the reproach of universal scepticism, by calling themselves Academicians (which see); and hence the appellation of Pyrrhonists.
rhonists fell into disuse, whilst the doctrine of Pyrrho had many advocates. For the difference between them, see Sceptics.

Le Clerc observes, that the Pyrrhonians destroy itself; for if there be nothing certain, then must that dogma itself be precarious; and if no one thing be more probable, or liker to truth than another, why shall the principle of the Pyrrhonians be believed preferably to the opposite one? since itself is come at in the same way as our other knowledge. Brucker's Hist. of Philos. by Enfield, vol. i.

PYRRHUM, in Ancient Geography, a town of Pannonia, on the route from Petovio to Sicia, between Aquaviva and Dautona, according to the Istin. of Antonine.

PYRRHUS, in Biography, king of Epirus, one of the most distinguished warriors of the period in which he flourished, supposed to be descended from Pyrrhus, the son of Achilles, was the son of Eácides, who was expelled the kingdom by a revolt of his subjects. When Pyrrhus was only twelve years of age, he was placed on the throne of his ancestors by Glaucis, king of Illiria, who had protected him in his infancy. He reigned in peace till he was about seventeen years of age, when, being absent from his kingdom, his subjects feized his treasures, and conferred the crown upon his great uncle, Neoptolemus. Pyrrhus being possessed of no force to enable him to recover his authority, repaired to Demetrius Poliorcetes, the son of Antigonus, who had married his sister, and under that eminent commander he learned the art of war, in company with many officers and soldiers of Alexander the Great. At the battle of Ipsus, in the year B.C. 301, he greatly distinguished himself, and after his loss by Demetrius, he secured for him the Greek cities, with the care of which he had been entrusted. When a treaty of peace was concluded between Demetrius and Ptolemy Lagus, king of Egypt, Pyrrhus consented to be one of the hostages sent into that country for the performance of the conditions. In the Egyptian court he excited general admiration by his amiable and correct behaviour, and his dexterity in martial exercises; and he obtained from the king his daughter Antigone in marriage. The next step was to restore him to his throne, which was effected by an armament supplied by Ptolemy, with the aid of which he defeated Neoptolemus. That prince, however, being supported by his allies, Pyrrhus consented to allot him a share of his dominions; but such a partnership was not likely to be durable, and Neoptolemus, it was said, attempted to poison Pyrrhus, which gave the latter a pretence to order his death. He being settled on the throne of Epirus, began to execute those schemes of ambition, in which the remainder of his life was spent. A civil war raging between the two sons of Callander, in Macedonia, one of them, Alexandre, applied to Pyrrhus for assistance. He gladly took occasion of interfering in the affairs of that kingdom, and being put in possession of all its maritime towns, proceeded to conquer the reft for Alexander. A peace was made, by which Macedonia was divided between the two brothers, and Pyrrhus seems to have withdrawn his troops to his own country. Shortly after, Demetrius made himself master of the kingdom, and notwithstanding their former friendship, hostilities ensued between him and Pyrrhus, who harassed him by incursions into Thessaly. They mutually invaded each other's kingdoms; and in one instance, Pyrrhus gained so complete a victory over the principal general of his antagonist, and displayed so much courage, that he struck with admiration the Macedonians whom he had defeated, who deferted their own king, and chose Pyrrhus for their sovereign. This occurred in the year B.C. 287. He held this crown, however, a short time; for Lycaimachus, in the following year, entering the country with a powerful army, and remonstrating against the injustice of conferring the kingdom on a foreigner, in prejudice to him, a native and commander under Alexander the Great, the allegiance of the Macedonians seemed to Pyrrhus so little to be relied on, that he withdrew from the contest, and returned to Epirus. The Romans, engaged in a war with the Tarentines, looked for affility to Pyrrhus. This prince eagerly listened to the proposal, and communicated his determination to his prime minister Cynes, who, being more prudent than his master, endeavoured to dissuade him from it. The enterprise was, however, resolved on, and Cynes was sent with a body of troops to Tarentum, where he subverted the Roman influence, which was beginning to prevail, and obtained the command of the fleet for an Epirian officer. Pyrrhus followed, and having left his son Ptolemy regent of Epirus, landed in Italy, in the year 280 B.C., bringing with him an army of about 25,000 men, of whom 7000 were Macedonians, the veteran soldiers of Alexander the Great. He also brought a number of war elephants, which was the first time that these animals were seen in that character, in Italy. He was greatly endangered in his passage by a storm, which dispersed his fleet, and destroyed some of the ships that kept company with him. On his arrival at Tarentum, he began to correct the licentious manners of the inhabitants, and ensure them to military discipline. At length he marched out to meet the Roman consul Valerius Lavinius, who was waiting for him on the bank of the Siri, in Lucania. The engagement was extremely obstinate, and Pyrrhus, who exerted himself in a manner worthy of his high reputation, was in great personal danger. Victory, however, decided in his favour, and he took possession of the enemy's camp. In interring the dead he made no distinction between his own men and the soldiers of his antagonist, but bestowed due encomiums upon the bravery of his fallen foes. He followed up his victory, and had proceeded so far as to obtain a distant view of Rome. The advance of the other confiul obliged him to retire, and he finished his campaign by returning to Tarentum. Sensible that he had engaged in no easy task, he was delighted to receive an embassy from the Romans, which he imagined was to solicit peace, but it was only to negotiate an exchange of prisoners. In this embassy was included the virtuous Fabricius, whom he in vain attempted to gain to his interest by large offers. He then attempted to make a treaty, and sent his minister, Cynes, to Rome for that purpose, but was unsuccessful.

In the next campaign, two consuls with their armies marched against the king of Epirus; the battle was extremely bloody, and the victory so indecisive, that both parties claimed it: one of the consuls was killed, and Pyrrhus was severely wounded; and such was the loss of men, that to one who congratulated him as having been the conqueror, he frankly replied, "such another victory will ruin me." Both the consuls of the next year, one of whom was Fabricius, were employed to oppose Pyrrhus, who had received fresh reinforcements from Epirus. They advanced to the Tarentine territory, where, while they were seeking an opportunity to engage, an offer was made them by the physician of Pyrrhus, to take him off by poison. Detect-
ing the treachery, they informed the king of his danger, which so affected him, that he immediately liberated all his Roman prisoners without a ransom. He now sent Cynoas to Rome to renew the attempt at negotiation, but was again unsuccessful. During the state of perplexity which a refusal had thrown him into, he was invited by the Syracusans and others to lend his aid against the Carthaginians, who had established themselves in Sicily. He accordingly seized the pretext for changing the field of action, and embarked the whole army for that island, leaving only a strong garrison in Tarentum. On his arrival he was received with general acclamations, and all the public force of Syracuse was put into his hands. He was soon so completely successful, that the Carthaginians sent deputies to Pyrrhus to treat for peace, but he refused to listen to any other condition, than that of their entire evacuating the island. In confidence of success, he caused a fan to be proclaimed king of Sicily, and then made preparations to cross over into Africa, and carry the war into the Carthaginian territories. These projects were not agreeable to the Sicilians, who became alienated from him, and whom he treated not as friends, but as a conquered people. After this he quitted Sicily, and embarked for Italy; in his voyage he was encountered at sea by a Carthaginian fleet, which sunk a number of his vessels and dispersed the rest, so that he reached a port in Italy with no more than twelve sail. Six years did he confine in Italy and Sicily, inflicting and suffering all the evils of war, and finally exhausted in force, and with diminished reputation. His retreat was not subdued, and for the purpose of employing and paying his soldiers, in conjunction with a body of Gauls, he made an irruption into Macedonia, where Antigonus Gonatus then reigned. His forces were beyond his expectations, for he not only obtained the pillage of many cities, but defeated Antigonus in battle, and wrested from him almost the whole kingdom. He now marched with a powerful army into the Peloponnesus, at the request of Cimonnes, and appearing before Sparta, required the inhabitants to receive his friend as their king. Upon their determination to resist this mandate, he attacked the city, but was repulsed with the loss of many men: he now retired to Argos, where, through the treachery of Arcteas, a bloody conflict ensued, during which, a woman, who saw Pyrrhus just going to kill her son, hurled a tile from the top of the house, which brought the king to the ground. In this state a Macedonian dragged him to a porch, and was going to cut off his head, when Pyrrhus opened his eyes, and gave him to receive a look, that his trembling hand failed in its office, and it was not till after repeated strokes, that he could execute his purpose. Thus in the year 272 B.C. terminated the life and exploits of this great warrior, whose career of reftlesse enterprise died alone could Rop. His military skill was held in the highest estimation by the Romans, who were so well able to judge of it by experience. Hannibal considered Pyrrhus as second only to Alexander, as a great general. He is said to have been the frill who understood the art of encampments, and of properly drawing up an army, and some treatises which he wrote on these subjects are mentioned by the ancients. He was brave to the borders of rashness, and sometimes left the commander in the field. He had unbeholden ambition, and a disposition perpetually to engage in new enterprises, for which, as we have seen, he readily abandoned such as proved more difficult than he had expected. He was fond of glory, but was poffessed of generosity, which disposed him to acts of kindness, and to a grateful acknowledgment of obligations. All his foes were warlike, and he encouraged the dispo-

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tion by the declaration, that he would leave the kingdom of Epirus to him, who had the sharpest sword.

**Pyrrhus Campus, or Pyrrhus Pedum**, in Ancient Geography, a canton of Africa, in Mauritian Tingitana, in the country of the Nechiheres, according to Ptolomy.

**Pyrrhus Campus**, a canton of Africa, in Interior Libya, between the country of the Leucathoibes and that of the Perorhi, according to Ptolomy.

**Pyrrhus Mona**, a mountain of India, on the sea-coast, on this side of the Ganges, according to the Periplus of Arrian.

**Pyrrstein**, in Geography, a town of Auferia, 10 miles N.W. of Lintz.

**Pyrephorus**, *Pyrephoae*, in the Athenian festival, Hephaestia, the same with Lamosadephorus.

**Pyrrularia**, in Botany, so called, as it seems, because the fruit resembles a little pear, Michaux Boreali. v. 2. 231; has received a new appellation from Palladino in his v. 4. 1114. *Hamiltonia*, which Mr. Purh adopts, in his Flora, 178. This genus, referred by Michaux and Palladino to Dioecia Pendentaria, is placed by Purh in Pendentaria Monogynae, though he allows it to be dioecious. It is said to be allied to *Nysa*. See that article.


1. *Hamiltonia obisfera* of Purh, *Pyrrularia puber* of Michaux, is the only known species, a native of shady woods, on the mountains of Peru, in Virginia, near the sweet springs, and in Carolina, flowering in May and June. This is a *frit*, from four to six feet high, very downy, with alternate, oblong, pointed, entire leaves. *Stipulas* none. *Flowers* very small, greenish-yellow, in terminal clusters. *Fruit* known in North America by the name of Oil-nut. The root is said to be made by Michaux to have an unpleasing smell.

PYRUS.

Peric. Apple roundish, umbilicated, fleshy, with from two to five membranous, more or less rigid, cells. Seeds two, rarely more, in each cell, oblong, obtuse, pointed at the base, convex on one side, flat on the other.

Ef. Ch. Calyx five-cleft. Petals five. Apple inferior, from two to five cells. Seeds two in each cell.

Our remarks under the article *Messilus* apply equally to the present genus, as to the propriety of referring to it the whole Linnean genus of Sorbus, and some species of *Crataegus* and *Messilus*; disregarding the difference in the number of their styles, which is evidently uncertain and variable, and distinguishing *Messilus* by its berry, *Pyrus* by its apple. Even this distinction proves, in some instances, obscure enough. We shall, for convenience, follow Willdenow in the order of the species, introducing our additional ones according to their affinities.


2. *P. melanocarpa*. Black Bilberry Apple. Willd. Enum. 525. Purfb n. 2. (P. arbutifolia 8; Willd. Sp. Pl. n. 1. and Ait. n. 1. Mespilus arbutifolia; Schmidt Arb. 86. Purfb.)—Leaves oblong-oblong, pointed, serrated; smooth beneath; their mid-rib glandular above. Flowers coriaceous. Calyx smooth.—Found in the bogs of Canada, and on the high mountains of Pennsylvania, Virginia, and Carolina, flowering in May and June. The *fruit* is large and black, resembling in taste the berries of *Vaccinium myrtillus*.


4. *P. ovalis*. Oval Berry Apple. Willd. n. 3. Pursh n. 4. (Mespilus Amelanchier? Walt. Carol. 148. *Crataegus picata*; Lamarck Dict. v. 1. 84.)—Leaves roundish-elliptical, acute, serrated, smooth. Flowers racemose. Petals obovate. Germin and segments of the calyx downy.—Native of swamps, from New Jersey to Carolina, flowering in April and May. A small *frut*; the *fruit* black, eatable. Purfb. Lamarck, who first distinguished this species, says it is twice or thrice as tall as the following, at least in the French gardens, with rounder *leaves* and smaller *flowers*, while the *fruit* is larger, being as big as a floe. The narrow coloured deciduous *branch* more, which occur in both species, are in the present longer than each partial *flower-flake*, which is not the case with *P. Amelanchier*.


256. Willd. n. 4. Ait. n. 3. (Mespilus Amelanchier; Linn. Sp. Pl. 685. Jacq. Aufr. t. 300. Mill. l. t. 178. f. 1. Vaccinia alba; Ger. Em. 1416.)—Leaves roundish-elliptical, acute, serrated; downy beneath. *Flowers* raceme. Petals lanceolate. Germin somewhat downy. Segments of the calyx smooth.—Native of rocky mountainous situations in Germany, Switzerland, France, and the isle of Crete; common in shrubberies, ever since Gerard's time, blooming in May. From three to six feet high, or more when cultivated, making an elegant appearance with its copious drooping clusters of snowy *flowers*, whose *flakes* are very woolly. *Fruit* blueish-black, sweet, the size of a currant.

6. *P. criplicata*. Cretan Berry Apple. Willd. n. 5. Prodr. Fl. Grec. n. 1157. (Chamaecerasius Idaea; Alpin. Exot. 4.)—Leaves roundish, emarginate, with a small point, serrated; woolly beneath. Flowers racemose. Petals lanceolate. Germin and segments of the calyx woolly.—Found on the mountains of Crete. This differs from the last, of which it is juilply supposed of being a mere variety, in having rounder *leaves*, whose pubescence underneath is more permanent; as well as in having more woollyflakes than the *flowers*.


8. *P. communis*. Common Pear-tree. Linn. Sp. Pl. 686. Wildd. n. 6. Ait. n. 4. Sm. Fl. Brit. n. 1. Engl. Bot. t. 1758.—Leaves ovate, serrated, finally smooth. *Flower-flakes* coriaceous. Fruit elongated at the base.—Native of various parts of Europe, but even more general as a cultivated plant, the varieties of whose fruit are many of them highly valuable for the table. The truly wild, or iron, pear is not eatable. It blooms in April or May. The *tree* is tall and handsome; the wood light, fine-grained, and tolerably hard, making neat furniture. The branches, at first erect, subsequently become curved downwards, and pendulous. The serratures of the *leaves* commonly disappear by culture, as do the strong *thorns* found on the wild tree. When young, the *leaves* are downy beneath, and fringed with white. *Flowers* white, with pale *red anthers*; their inflorescence coriaceous, not umbellate as in the apple. *Fruit* obovate, more or less elongated at the base.

9. *P. polleuaria*. Woolly-leaved Pear-tree. Linn. Mant. 2. 244. Willd. n. 7. Ait. n. 5. (P. pollivillera; Bauh. Hist. v. 1. 59. Munch. Hauft. v. 3. part 2. 333.)—Leaves ovate, strongly serrated; most downy beneath. *Flower-flakes* coriaceous, subdivided.—Native of Germany, according to baron Munchhausen. John Bauhn first met with it in the garden of baron Pollvill, in Alfatia. It was sent to Kew, in 1786, by the late Mr. Graffer. This differs from the common Pear-tree in having the *leaves* downy on both sides, but especially beneath; the *flowers* cream-coloured, much smaller and more numerous, even forty in each *coromb*, their partial *flakes* being branched and forked. The *fruit* is small, sometimes but an inch long, and falls early when ripe.

flowering early in May. The leaves are white and silky beneath; nearly smooth above. Flowers large, white, strongly scented, in a simple downy corymb. Fruit about

two inches in diameter, globose, rather depressed, purplish-green. When gathered in October, as utile as an unripe medlar; but after lying a few weeks, it first acquires a sweet scent, which is but temporary, and at length towards December, these pears become soft, like medlars, and very
good eating.

11. P. malus. Common Apple, or Crab, tree. Linn. Sp. Pl. 686. Willd. n. 9. Ait. n. 6. Sm. Fl. Brit. n. 2. Engl. Bot. t. 179. Fl. Dan. t. 1101. Mill. Ill. fl. t. 44. (Malus sylvestris; Ger. Em. 1561.)—Leaves elliptic-oblong, pointed, serrated, smooth. Umbels simple, sefulle. Styles smooth.—Native of woods and hedges throughout Europe, and till more valuable, for its innumerable and useful varieties, as a cultivated plant, than even the Pear, n. 8. The Crab itself, or Wild Apple, though always too utile to be eaten raw, is subject to some varieties that are worthy of notice for kitchen use. This species produces its elegant pink-coloured blossoms in May. The branches are more horizontal than those of P. communis, as well as more twilled and disordered. The younger leaves are downy beneath. Fruit roundish, cohe-
cave, or umbilicated, at the base.

12. P. pumila. Dioecious Pear-tree. Willd. n. 10. Phytogr. f. 1. 8. Moench. Weidett. 87. t. 8. Wildl. (Malus non florens, fructiferum tamen; Bauh. Pin. 433.)—Leaves oval, pointed, serrated. Flowers axillary, dioecious. Petals linear, the length of the calyx.—The native country of this singular plant is unknown. Professor Willdenow, from whom we have dined specimens, supposes it to be possibly a variety of the preceding species. The flowers are small, forming in appearance short downy umbels, at the ends of the branches, but each separate stalk is accompanied by a leaf. Petals yellowish-green, not exceeding the calyx. Styles five, smooth. We have seen the female plant only.


Wildl. n. 11. Curt. Mag. t. 267. Schnee. IC. t. 15.—

Leaves oval-oblong, serrated, smooth. Umbels simple, sessile, nearly smooth, without bracteae. Styles woody at the base. Native of China, from whence Dr. Fothergill is said to have imported it in 1786. The tree proves tolerably hardy in our gardens, flowering early in May. The leaves are furnished with copious shallow ferratures, and have downy footstalks and ribs. The umbels are nearly, if not quite, smooth, and consist of eight or ten large and handsome rose-coloured flowers, for which alone this plant is cultivated, the fruit, which is yellow, an inch in length, and usually elongated a little at the base, being sparingly produced, and of no value. We can discover no braeacteae, and if we are not mistaken, the want of them affords the surest mark of distinction between this species and the two following.


Ait. n. 8. (P. Malus 2; Ait. ed. 1. v. 2. 1757. Cra-
tegus ocellati folio, floribus magnis; Mill. IC. t. 269.)—Leaves ovate, pointed, with shallow ferratures. Umbels simple, sessile, downy. Bracteae linear, toothed, deciduous. Styles woody at the base.—Native of Siberia, according to Miller, who says the seeds were sent from Dauria to Petersburgh, and who had it, bearing flowers and fruit, at Chelsea, before the year 1758. This tree is now common in gardens, the fruit, which resembles a white-heart cherry in size and colour, but which is liable, in both respects, to vary, being esteemed for preserving, as well as for tarts; nor is it, when mellowed by fruit, unpleasant to eat raw.

The leaves are rather more downy than the latt, but their ribs are smooth. Flowers copious, with a light sweet scent, their colour much paler and their size smaller than P. spec-
tabilis. Flower-stalks very downy. Braidate smooth, mem-
branous, very narrow, above half an inch long.

15. P. baccata. Small-fruited Crab-tree. Linn. Mant. 75; excluding the reference to Miller. Willd. n. 13. Ait. n. 9. Pall. Roff. v. 1. p. 23. t. 10. Giseke lc. fals. t. 12. (Crategus cerea folia, floribus magnis; Amm. Ruth. 155 t. 31.)—Leaves ovato-lanceolate, pointed, sharply serrated, smooth. Umbels simple, smooth, sessile. Bracteae linear, slightly toothed, deciduous. Styles naked. Fruit smaller than the petals.—Found in low situations, about the banks of rivers, in Siberia, flowering the end of May. We received specimens from the garden of the late Right Hon. Charles Greville, at Paddington, in flower April 21, 1803. This differs from the last, with which some botanists have confounded it, in having broader, more acutely serrated, smoother leaves; smooth flower-stalks and styles; and a small red fruit, not bigger than a common haw. The calyx in both is deciduous, leaving a scarred hollow on the top of the fruit.


flalks corymbose. Styles woody in the lower part. Native of woods in North America, from Pennsylvania to Carolina, flowering in May. It has long been cultivated in England, for the sake of the beauty and violet-like fragrance of its bluish-coloured blossoms, as well as for its fruit, which is as big as a small golden-pippin, extremely acid, but excellent for preserving with sugar. The leaves are distinguished by their breadth, and by being slightly lobed, like some of the leaves deeply cut leaves of the Hawthorn, but thrice as large.


Pursh n. 8. (P. coronaria; Wangerh. Amer. 61. t. 21. f. 47.)—Leaves lanceolate-oblong, thinning, with tooth-like notches; contracted and entire at the base. Flowers-corymbose. Found in the low woods of Carolina, flowering in May. It resembles the foregoing species, but the fruit is very small, Pursh. This is said in Hort. Kew. to have been cultivated in 1750, by Mr. Chipperton Gray. We have never examined it, nor have we any account of the flowers being downy or otherwise.


Wildl. n. 16. Ait. n. 12. Curt. Mag. t. 692. (Malus Japonica; Andr. Repof. t. 462. Buke; Kamps. Amo. 844.)—Leaves elliptic-oblong, sharply serrated, very smooth. Stipules lanceate, deeply toothed. Flower-stalks somewhat aggregate. Calyx abrupt. Seeds numerous in each cell.—Gathered by Thunberg, on mount Fakona in Japan, where it flowers from February to April. It proves quite hardy in our gardens, into which Sir Joseph Banks introduced it in 1796, flowering at the same season, and also frequently again in autumn. When the spring is severe, the beautiful deep scarlet blossoms require the shelter of a glass frame. The fruit is somewhat thorny. Leaves deep green; the fruit that come out are short and abrupt. Stip-

ulolates on the young branches, half an inch or an inch broad. Fruit globular, we have not seen it ripe. Seeds very num-

erous in each cell, one above another, so that we cannot but feel some scruples as to the genus of this species.


Woddy.
PYRUS.

Woodv. Med. Bot. t. 79. (Malus cotonea; Ger. Em. 1452. Matth. Valgr. v. 1. 217.)—Leaves roundish-elliptical, entire; downy beneath. Flowers solitary, raked. Calyx serrated, reflexed.—Native of the rocky banks of the Danube. Naturalized in the hedges of Germany. Dr. Sibthorp found it wild in the northern parts of Greece, in which country it retains the ancient name *vomius*. This was among the first exotic fruits cultivated in England, where it blooms in May or June, and ripens fruit in autumn. The tree is rather spreading than tall. *Leaves* roundish, various in size; smooth and light green above; white with soft down beneath. *Flower-flats* and calyx more or less woolly. *Petal*, large, flesh-coloured. *Fruit* large, yellow, with a yellow and alligator, but with a peculiar and very powerful fragrance. Cookery renders it mild, and to moft perons highly grateful. There are three or four angual *seeds* in each cell, ranged horizontally, not, as in the last, vertically. The Quince is supposed to be the golden apple of the Hesperides, so famous in ancient fable.

20. P. falsifolia. Willow-leaved Crab-tree. Linn. Suppl. 255. Wildl. n. 18. Ait. n. 14. Pallas Roff. v. 1. p. 20. t. 9.—Leaves linear-lanceolate, hoary, nearly entire; downy beneath. Flowers solitary, almoft fiffie. —Native of Siberia, America, and mountain Hamaus. Sent to Kew, by Pallas, in 1780. It is a hardy tree, flowering early in spring, and known by its hoary, narrow, willow-like leaves. The *flowers* are terminal, solitary, and nearly fiffie; not axillary. *Fruit* pear-shaped, an inch long, brown, not at all liable till mellowed by fruit, like medlar; and even then not very good.


22. P. Aria. White Beam-tree, or White Wild Pine-tree. Ehrh. Beitr. falc. 4. 20. Arb. 84. Sm. Fl. Brit. n. 7. Engl. Bot. t. 1858. Wildl. n. 15. (Crataegus Aria; Linn. Sp. Pl. 681. Fl. Dan. n. 301. t. 302. Aria Theophratti; Ger. Em. 1327.)—Leaves elliptical, cut, and serrated; white and downy beneath, with crowded parallel veins. *Corymbs* compoud, woolly. Styles two or more.—Native of limefone rocks, or chalky hills, in most parts of Europe; not rare in the mountainous countries of England, flowering in May, ripening fruit in September. A hardy small tree, much cultivated in home plantations. The young branches, like the *flats*, *seeds*, and backs of the *leaves*, are very white, with mealy or cottony down. The *leaves* vary from deep green to obovate figure, to a more correct oval, and are pretty regularly cut, as well as serrated, but not finnated or lobed; their veins, or side-ribs, numerous, straight and parallel; their upper side smooth. *Corymbs* subdivided, many-flowered, cottony. *Petal* white, the fize of the fiole of the Hawthorn. *Styles* two, often three, rarely four. *Fruit* nearly glofular, scarlet, dotted, mealy and acid; its cells coriaceous rather than hory, equal in number to the *styles*, with two *seeds* in each.

23. P. intermedia. Swedish White Beam-tree. Ehrh. Beitr. falc. 4. 20. Arb. 94. Wildl. n. 20. Arb. 268. Ait. n. 16. (Sorbus alpina, folis finmollis; Fl. Dan. n. 302. t. 301. fig. in flower only. S. hybrida; Hudfl. 216.)—Leaves elliptical, lobed, cut and serrated; white and downy beneath, with rather diffent veins. *Corymbs* compoud, woolly. Styles two or more.—Native of Sweden. Found by Mr. Waring, on the walls of castle Dinast yBran, North Wales. *Hybrid*. Specimens from the original plant prove the fame as those of Ehrhart, and differ from the common *P. Aria*, only in having the *leaves* so far cut, as to be, in some degree, pinnatifid, owing to which the tranverse veins are rather more diffent from each other. We can scarcely admit it to be more than a variety, as *Linnaeus* made it in Sp. Pl. 681. It is his Lapiad plant, Fl. Lapp. n. 199.

24. P. pinnatifida. Baftard Mountain Ash. Ehrh. Beitr. falc. 6. 92. Exficc. 145. Sm. Engl. Bot. t. 2331. (P. hybrida; Sm. Fl. Brit. n. 6, excluding the synonym of Hudfon and Withering. Sorbus hybrida; Linn. Sp. Pl. 684. Linn. Fl. falc. t. 6. Wildl. Sp. Pl. v. 2. 1008. Ait. Hort. Kew. v. 3. 204. Fl. Dan. n. 302. t. 301. fig. in fruit.)—Leaves oblong, deeply pinnatifid, or half pinnate; downy beneath. *Corymbs* compoud, woolly. Styles about three.—Native of Sweden. Gathered wild, by the late Mr. J. Mackay, in rocky places on Cains na Callich, and other mountains, at the north end of the isle of Arran. It is frequent in plantations, flowering in May, and propagated by seed. This was thought by Linnaeus to be a mule, between *Aria*, and *aucuparia* hereafter mentioned. It nearly accords with the former, but the *leaves* are more oblong and acute; very deep pinnatifid, or even pinnate, in their lower part. The *flowers* and *fruit* almost agree with those of *aucuparia*. The *styles* are usually three or four.

25. P. aucuparia. Mountain Ash; Quicken, or Roan Tree. Ehrh. Beitr. falc. 6. 94. Gaernt. v. 2. 45. t. 87. Sm. Fl. Brit. n. 5. (Sorbus aucuparia; Linn. Sp. Pl. 683. Wildl. Sp. Pl. v. 2. 1008. Ait. Hort. Kew. v. 3. 204. Fl. Dan. t. 1034. Mill. Illutr. t. 43. Engl. Bot. t. 337. S. sylvestris; Ger. Em. 1473. Matth. Valgr. v. 1. 238.)—Leaves pinnate; leaflets equal, serrated, smooth. *Corymbs* compoud, somewhat paniced. Styles about three.—Native of mountainous places, in the colder parts of Europe; abundant in Scotland, Derbyshire, &c. flowering in May, and very common in domestic plantations. An elegant and very hardy tree, of flow growth, the wood being hard and tough. *Leaves* all diminifely pinnate, of many pair of opposite, oblong, smooth, serrated leaflets, more or less entire towards the base, with an odd one; the young ones downy beneath. *Flowers* very numerous, white, the fize of the three half, but rather more paniced. *Fruit* scarlet, acid and bitter, yet eatable when prepared with sugar. According to Lightfoot, this tree is found generally about the Druidical circles in North Britain, and is still believed, by the superstitious Highlanders, to be powerfuly efficacious against witchcraft.


O 2 found
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found it in Greece, as well as on mounts Hæmus and Ainos, and in woods near Constantinople. Ray speaks of it as wild in the mountainous parts of Cornwall and Staffordshire. It is now rarely cultivated, being, though a handsome tree, yet of slow growth, and inferior in the value of its fruit to the Medlar. A solitary individual of this species now and then occurs, about ancient manions and very old orchards. It blossoms in May. The leaves are larger, and the flowers twice the dimensions of the leaf, being the size of hawthorn-blossoms, rather paniced than corylmbofe. Fruit like a small pear, reddish, above an inch long, with five cells, unwarble to the five 

**fyles**; its cells with two valves, like those of a Common Pear; and though only one 

**seed** is perfect in each cell, Gartfer observed two in an early stage. This fruit, if tailed before it is mellow, occasions a molt intolerable forenses at the back of the palate, lasting many hours. When ripe it is soft, brown, and agreeably acid. The name **Service** is evidently a corruption of **Sortalns**.


28. *P. hybrida*. Mule Service Pear-tree. Willd. Moench. Weiflent. 90. t. 6. Willd..—Leaves elliptical, serrated, downy beneath; simple or pinnate, the terminal one largelf. Flowers corylmbofe. Calyx hairy. This fruit is afforded by Professor Wildeuow, from whom we have specimens, to be a mule production, from the first species, *P. arbutifolia*, impregnated by the 29th, *aucuparia*. It retains indeed as great a resemblance to both parents as it possibly could to what are so fimilar to each other. The simple leaves are two inches or more in length, obtuse, strongly serrated; the lateral leaves, of the compound one, half, or one-third, as large, unequal at the base. **Stipulæ** ovate, toothed, recurved. **Flowers** not much unlike the leaf, but their **cymes** somewhat smaller, with hairy, rather than downy, stalk. It is curious that the rib of each leaf, on its upper side, retains some portion of the brown glands characteristic of *P. arbutifolia*. **Stipulæ** lanceolate, a little hairy, deciduous.

29. *P. anthyllidifolia*. Kidney-vetch-leaved Service-tree. —Leaves pinnate, entire; febulous beneath. Corylmbs axillary and terminal, of few flowers.—Gathered in the Sandwich islands, by Mr. Menzies, to whom we are obliged for specimens, under the name of *Sorbus*, to which, since aboflhed, Linnaean genus there can be no doubt that this tree belongs, though we have not seen the fruit. The leaves are all uniformly pinnate, two or three inches long, of eight or nine pair, besides an odd one, of equal, oblong or obvate, obtuse, minutely pointed, entire leaves, half an inch at least in length; smooth and shining above; paler and febulous beneath. **Stipulæ** lanceolate, a little hairy, deciduous. **Flower**-folks axillary and terminal, nearly the length of the leaves, downy, corylmbofe, though each bears but three or four flowers, which are about the size of *P. aucuparia*. **Bractæs** awl-shaped. **Calyx** woolly. **Stylos**, as far as we can see, three, hairy at the base. The leaves of this very pretty and remarkable species strikingly convey the idea, at first sight, of some kind of *Anthyllis*, especially *A. Barbericosa*.

**PYRUS**, in *Gardening*, contains plants of the fruit-tree kind, of which the species cultivated are the common pear-tree (*P. communis*); the common apple-tree (*P. malus*); the Chinese apple-tree (*P. spectabilis*); the Siberian crab-tree (*P. prunifolia*); the sweet-scented crab-tree (*P. coronaria*); and the quince-tree (*P. cyprium*). With respect to the frift, it is observed that "the wild pear, the mother of all the orchard and garden varieties, is thorny. The frilled are fetaeous, white (or reddish), deciduous; the peduncles alternate; and the calyx clothed with a ferruginous wool.

There are numerous varieties; but those of most importance for cultivation are,

The little mufk, which is often termed the supreme. The fruit, when ripe, is of a yellow colour; the juice somewhat mufky; and, when gathered before it be too ripe, it is a good fruit. It becomes ripe about the latter end of July, but continues good only a very short time.

The chio, or little baird mufk, which is pretty much like the other, but smaller. The skin, when ripe, has a few flecks of red on the fun side.

The green chifel, or Haftings, which is a middle-sized fruit, that always remains green, and is full of juice when ripe. It becomes ripe in the beginning of August.

The red mucadelle, which is a large early pear, of great beauty; the skin is of a beautiful yellow, striped with red, and the flesh has a rich flavour. It sometimes produces two crops in a year; the first about the end of July, and the second in September, or thereabouts.

The little mulcat, which is a small pear, having the skin very thin, and of a yellowish colour, when ripe. This fruit has a rich mufky flavour, but does not keep long. It becomes ripe about the beginning of August.

The lady's thigh, which is here commonly called jargonelle, is of a ruffet-green colour from the fun, but towards it inclining to an iron colour; the flesh is breaking, and has a rich mufky flavour. It becomes ripe about the middle of August.

The Windlor, which has a smooth skin, and when ripe is of a yellowish-green colour; the flesh is very soft, and, if permitted to hang but two or three days after it is ripe, grows mealy, and is good for nothing. It becomes ripe about the latter end of August.

The jargonelle, which is commonly called cuife madame. According to Mr. Forfthy, it is certainly the true French jargonelle, and the pear that commonly goes by that name here is the real cuife madame, or lady's thigh; it being very probable that the names have been changed, in coming to this country. This pear is somewhat like the Windlor; the skin is smooth, and of a pale green colour. It is a plentiful bearer; but the flesh is apt to be mealy, if it stands to be ripe, which is about the middle of August. It bears well on coldars.

The orange mufk, which is of a yellow colour, spotted with black; the flesh is mufky, but very apt to be dry. It ripens about the latter end of August.

The great bouquet, or bagpipe of Anjou, which has a smooth skin of a pale green colour; the flesh is soft, and full
full of juice of a rich flavour. It ripens about the middle of August.

The little blanquet, which is much less than the former, of a pale colour, and the flesh tender, and full of a rich musky juice. It ripens about the latter end of August.

The long-stalked blanquet has a very smooth skin, white, and a little coloured towards the fun, and is full of a rich fuggy juice. It becomes ripe at the latter end of August.

The skinless or early ruffleet, which is of a reddish colour, the skin extremely thin, and the flesh melting and full of a rich fuggy juice. It ripens in the latter end of August.

The musk drone, which has a skin of a yellow colour when ripe, and a rich musky taste; but is apt to grow mealy, if left too long on the tree. It ripens about the beginning of September.

The red orange, which is of a greenish colour, but the side next the fun changes to a purple colour, when ripe; the flesh is melting, and the juice fuggy, with a little perfume. It ripens in the beginning of August.

The calloette, or green muceat, is a small greenish pear, with some specks in the skin. It is full of a rich perfumed juice, and ripens in the latter end of September.

The great onion, brown admired, or king of summer, which is of a brownish colour next the fun, and becomes ripe in the beginning of September.

The musc orange, in which the skin is green, and the flesh melting. It ripens in the beginning of September.

The averat, or August muceat, which has a smooth skin of a whitish yellow colour; the juice is richly sugared and perfumed, and it is esteemed one of the best summer pears yet known. It is a great bearer, and becomes ripe in the beginning of September.

The rofe, or thorny rofe, which is shaped like the great onion pear, but much larger, of a yellowish-green colour, but a little inclining to red next the fun. The flesh is breaking, and the juice musky. It becomes ripe in the beginning of September.

The poire du puchet, which has the flesh soft and tender, and the juice fuggy. It ripens in the beginning of September.

The perfumed pear, which is of a deep red colour, spotted with brown; the flesh melting, but dry, and has a perfumed flavour. It ripens in the beginning of September.

The salviati, which is red and yellow next the fun, but whitish on the other side; the flesh is tender, and the juice fuggy and perfumed. It ripens about the middle of September.

The rose water, which has the skin rough, and of a brown colour, the juice very sweet, tallowing like rose-water. It ripens in the latter end of September.

The ruffleet, in which the flesh is soft and tender, and the juice agreeably perfumed. It ripens in the latter end of September.

The great mouthwater, which has the flesh melting and full of juice. It ripens about the latter end of September.

The prince's pear, which has a highly-flavoured juice, and is a great bearer, ripening about the latter end of September.

The summer bergamot, which is sometimes called Hamden's bergamot. The flesh is melting, and the juice highly perfumed. It ripens about the latter end of September.

The autumn bergamot, which is smaller than the former; the flesh is melting, and the juice highly perfumed. It is a great bearer, and ripens in the beginning of October.

The summer bonichretien, which is very full of juice, and is of a rich perfumed flavour. It ripens about the middle of September.

The beurre rouge, (the red butter pear,) which has the flesh very melting and full of a rich fuggy juice. It ripens in the beginning of October, and, when first gathered from the tree, is one of the very best sorts of pears.

The dean's pear, which has the flesh melting and full of juice, which is very cold. It is a great bearer, and ripens in the beginning of October.

The Swiss bergamot has a melting flesh, and is full of juice. It ripens in the beginning of October.

The long green, in which the flesh is melting and full of juice. It ripens in the latter end of October. It is, by some, reckoned the same with the mouthwater.

The white and grey monsieur John, which are the same; the difference of their colour proceeding from the different soils and situations wherein they grow, or the storks on which they are grafted. If this pear be rightly managed, there are not many sorts in the same season to be compared with it. The flesh is breaking, and full of a rich fuggy juice. It ripens in the latter end of October or beginning of November.

The flowered muceat, which is an excellent pear; the flesh is very tender, and of a delicate flavour. It ripens in November.

The vine pear, which is of a dark red colour; the flesh very melting, and full of a clammy juice. It comes into eating in November.

The routeline pear, which is of a deep red colour, with spots of grey; the flesh is very tender and delicate, and the juice very sweet, with an agreeable perfume. It ripens about the latter end of October, but does not keep.

The knife's pear, which has the flesh fine and tender, and the juice very much sugared. It ripens in the latter end of October.

The marquis pear, which, when it does not change yellow in ripening, is seldom good; but if it does, the flesh will be tender, delicate, and very full of juice, which is sugared. It comes into eating in November.

The Crafane pear, which has the flesh extremely tender and buttery, and full of a rich sugared juice. It is the very best pear of the season, and comes into eating about the latter end of December.

The Laflac, or Dauphiné pear, which has the flesh yellow, tender, and melting; the juice is sugared, and a little perfumed. It is in eating the beginning of December.

The martin fee (the dry martin), which is almost like the ruffleet in shape and colour; the flesh is breaking and fine; and the juice sugared, with a little perfume. It is in eating about the beginning of December.

The amadot, which is rather dry, but high-flavoured; it is in eating about the middle of December.

The little lard pear, which is extremely fine; the flesh melting; the juice much sugared, and has an agreeable musky flavour. It is in eating the latter end of December, and is esteemed one of the best fruits in that season.

The Louisfon (the good Lewis), which has the flesh extremely tender, and full of a very sweet juice. It is in eating about the middle of December.

The Colmar pear, which is very tender, and the juice greatly sugared. It is in eating about the beginning of January, and is esteemed an excellent fruit.

The Pefchafierie, which has the flesh melting and buttery; the
the juice is fragrant, with a little perfume. It is in eating about the first of January. It bears on standards.

The virgoulene pear, which is esteemed by some as one of the best fruits of the season; the flesh is melting, and full of a rich juice. It is in eating about the first of January. In dry and cold seasons it is very apt to crack, which greatly diminishes its value.

The ambrette, which is esteemed a very good pear; the flesh is quite melting, and full of sweet, very in yellow; its juice highly perfumed. It is in eating about the latter end of December.

The St. Germain pear, which is a fine fruit and keeps long; the flesh is melting, and very full of juice, which in a dry season, or if planted on a warm dry soil, is very sweet. It is in eating from December till February. Mr. Forsyth remarks, that it is an excellent bearer, when planted as a dwarf standard, and comes in succession after the same sort of pears on wall-trees are over.

The St. Auln, which is pretty full of juice, and which is often a little sharp; the flesh is tender but not buttery. It is in eating the latter end of December, and continues good two months or longer.

The Spanish bonchretien, which is a large fine pear; the flesh is breaking, and the juice sweet. It is in eating in January.

The wilding of Cafay, which is also called the small winter butter pear, is a small fruit; the flesh is melting, and the juice very rich; it is an excellent bearer on standards. It is in eating in January.

The martine, or the lord martine, which is a good fruit; the flesh is breaking and full of juice, which is very sweet and a little perfumed. It is in eating in January.

The winter russelet, which has the flesh buttery and melting, and generally full of a sweet juice. It is in eating in the latter end of January.

The franc real, or the golden end of winter, which is only esteemed for baking.

The brown beurré, which is of a reddish-brown colour on the side next the sun, and yellowish on the other side. The flesh is melting, and full of a rich juice. It ripens in October, and is esteemed an excellent pear.

The Holland bergamot, amoselle, or lord Cheney's, which is a very good pear; the flesh is half buttery and tender, and the juice is highly flavoured. It keeps from the end of January till April.

The German mufcat, which is an excellent pear; it is buttery and tender, and the juice is highly flavoured. It is in eating from February till April or May.

The pear of Naples, or Easter St. Germain, which is half-breaking; the juice is sweet, and a little vinous. It is in eating in March.

The winter bonchretien, which is very large; the flesh is tender and breaking, and is very full of a rich sugar'd juice. It is in eating from the end of March till June.

The lâ palatelle, which is tender and buttery, and the juice sweet. It is in eating in March.

The St. Martial, or the angelic pear, which has the flesh tender and buttery, and the juice very sweet. It is in eating in March.

The wilding of Chaumontelle, which is melting, the juice very rich, and a little perfumed. It is in eating in January.

The brown St. Germain, which is a very fine high-flavoured pear on dwarfs and standards, and comes in after the wall St. Germain. It continues in eating from December to the end of March.

The pear d'Auch, which was introduced by the late duke of Northumberland. It much resembles the Colmar, but is fuller towards the stalk. It is in eating from Christmas to April, and is, without exception, the best of all the winter pears.

The swan's egg, which is a middle-sized pear, in a shape like an egg; it is of a green colour, thinly covered with brown; the flesh is melting, and full of a pleasant muskty juice. It comes in eating in November. It is healthy, and bears well either as a standard or in any other way.

The bergamot de paque, which has also the following names: the terling, the amoselle, the Paddington, and the Tarquin. It is a fine handome fruit, green when gathered, and of a yellowish or straw-colour when ripe. It comes into eating about the month of April, continues till June, and makes a very handsome appearance at table.

The golden beurré, which is a very fine pear; it is of a beautiful scarlet colour next the fun, and of a gold colour on the other side. The flesh is melting, and the juice highly flavoured. It ripens in October. It succeeds best on an earth aspect, and a loamy soil. It is a plentiful bearer. Mr. Forsyth observes, that it was introduced from Burgundy by the late marshall Conway, and was first raised, in this country, at his seat of Park Place, near Henley-upon-Thames, now the seat of lord Malvern.

The Williams's feeding pear, which resembles a summer bonchretien, but is more juicy, is a great bearer, and ripens in September. Mr. Forsyth says that it will be a valuable acquisition to the market-gardeners, as it immediately succeeds the Windsor pear.

The citron de Carmes, which is a middle-sized pear, of a yellowish-green calk, full at the eye; of a round shape, but tapering a little towards the stalk, which is long. It becomes ripe in July.

And the true golden beurré, which in shape and size resembles the brown beurré; but is of a reddish-brown colour next the fun. It is a very fine pear, but does not keep long. It comes into eating in October.

Mr. Forsyth gives the following selection from Anderson's and Co.'s Catalogue of Edinburgh.

Of the Summer Kind.—The pear James, which is soon ripe, and soon rotten, has a little flavour, and is the earliest pear in Scotland.

The early carnock, which is indifferent, of a yellow colour, and bright-red towards the fun; making a beautiful standard tree.

The lemon, lady's lemon, or lady Lamont, which is indifferentely good, but principally valued for coming early, and being a good bearer in common.

The green pear of Pinkey, which is a small green pear, nearly round, of a sweetish taste or flavour.

The forrow cow, a Clydefdale pear, which is a large pear with a short stalk; flat towards the eye; the colour red and yellow; the flesh tender, and musky in its flavour.

The pear fance, a Clydefdale pear, which is a big-bellied beautiful pear; the tree large, a great bearer, and fit for an orchard; but the fruit is not very good.

The grey honey, which is a pretty good pear.

The green orange pear, or orange vert, which is a very good pear.

The brute bone, chaw good, or the pope's pear, which is only an indifferent fort.

The golden knap, supposed Scotch, which is a small summer pear, of tolerably good qualities.
The early achen, an indifferent fruit; greatly inferior to the winter pear of that name.

The hanging leaf, which is the name in Clydefdale, is good and beautiful; almost round; its colour red and yellow; a delicious sweetmeat is found in its stipe.

The Scots bergamot, which is a large good pear, of a yellow and red colour; its flesh tender and juicy.

The Longueville, which is very good, but a precarious bearer; supposed French, though not in their catalogues under that name.

The musked bonchriet, gratiole, cucumber, or Spinola's pear, which is a very good pear when grafted on a true stock; its pulp being somewhat between short and tender, with a great deal of perfumed juice, its colour red on one side, and white on the other.

And the furrat pear, which is a pretty large well-shaped pear, fit for the orchard or the field.

Of the Autumnal Kinds.—The keather, which is a Clydefdale pear, of middling size, and oblong shape, its juice agreeable.

The French carnock, which is tolerably good.

The elphin haft, or good-man pear, which is a long pear, flat towards the eye: its colour green and yellow; its flesh hard, dry, and sweet in the stipe.

The Drummond, or late Scotch carnock, which is very good, if eaten before it grows mealy; its colour a bright red and yellow.

The vicar, an oblong pear, with the colour yellow, red, and striped; tender, sweet, and musked, but dry in eating.

The royal orange bergamot, which differs from the orange bergamot in being yewyolent, and sometimes having a faint red on one side.

The green pear of Yair, which is sweet, juicy, and melting; of a moderate size; taking its name from Yair, on Tweed-side, where it was first discovered.

The roh hind, which is very indifferent.

The le beffier, the wilding of the forest of Ileri, in Bretagne, which is a yellowish pear, of middle size, but which is indifferent.

The unicorn pear, which is of a beautiful red and yellow colour; but rather auliere in the stipe or flavour.

Of the Winter Kinds.—The winter achen, which is a Scotch pear; among the best early winter pears, and equal to most of those of the French kind.

The brier bush, which is Scotch; a good pear, and will ripen in most seasons; it is a small pear, of a firm substance, and sweet stipe.

The Brompton park, which is a seedling sent by Jefferys of that name.

The round winter, which is a Clydefdale pear, a very excellent winter pear.

The poir portrait, or gate pear, which is proper for baking.

The la double fleur, or the double-flowering pear, which is a large flat beautiful pear, with a smooth skin, and blush colour on one side, and yellow on the other: it is the best to prefer, taking a beautiful red colour from the fire.

And to thefe: the following list is added:—The Ambrofia pear, the Ashton town, the autumn monk bonchriet, the bishop's thumb, the bloody pear, proper for baking, the brocas bergamot, the harland, proper for perry, the befier, fit for baking, the heurier du roi, the black pear, or Worcester, fit for baking, the Britannia, the burelleu, the Doyenne, or St. Michael, the caftillac, fit for baking, the Easter St. Germain, the Gafell's bergamot, the golden beurré, the grey beurré, the grey good-wife, the green furgar, the green bergamot, the Huntingdon pear, the huff-cap, proper for perry, the king's Catharine, the lammas, the London furgar, the muscat alsain, the muffl blanquet, the Oldfield, proper for perry, the orange bergamot, the pear piper, the furus pollveria, the red admirable, the rough cap, proper for perry, the Scotch bergamot, the seme-angled, the silver-striped, the Spanish red warden, befit for baking, the fwarz, proper for perry, the striped verte longue, and the white beurré.

And for small gardens, where there is room only for a few trees, the following are recommended as proper for furnishing a regular succession of fruit.

Summer Kinds.—The musked pear, the green chifell, the jargonelle, theummer bergamot, and the summer bonnechret.

Of the Autumn Kinds.—The orange bergamot, the autumn bergamot, the Gafell's bergamot, the brown beurré, the Doyenne, or St. Michael, and the Swan's egg.

Of the Winter Kinds.—The Craffane, the Chaumontelle, the St. Germain, the Colmar, the d'Auch, the Pechsalle, the winter bonnechret, and the bergamot de paque.

And the second fort, in its wild state, is the crab, or wilding, and is armed with thorns, as well as the wild pear. Miller mentions two varieties in the fruit of the crab, one white, the other purple towards the fun; but it is commonly yellowish-green with a tinge of red. And also a variety with variegated leaves.

There are a great many varieties of the apple, but the following are given by Mr. Forsyth as the most deserving of attention.

The Acklam's ruflet, which is a small Yorkshire apple, of a ruflet colour toward the fun, and yellow on the other side; it becomes ripe in January, and keeps till March.

The aromatic pippin, which is a very good apple, of a bright ruflet next the fun; and the stipe has a fine aromatic flavour. It ripens in October.

The Baxter's pearmain, which is a real Norfolk apple, of a handfome flize, and pale-green colour, full of small dark spots. It is a fine kitchen fruit, and will keep till April. It is also a good eating apple.

The beauty of Kent, which is a fine large apple, resembling a codling. It is streaked with a fine red towards the fun, and of a beautiful yellow, with some streaks of red on the other side. It is a very good apple, coming into eating in September, and keeping till the latter end of April.

The belia gristline, which is a new seedling raised at Norwich, of much beauty, and never failing to afford crops. It was first propagated by Mr. Lindley, who gave it this name. It is a handfome apple, resembling the burdoff, of a yellow colour, with red towards the fun, and an excellent table apple, keeping till March.

The Bell's pearmain, which is a real Norfolk apple, large and handsome; red toward the fun, and yellow on the other side. It is a fine kitchen fruit, and pretty good to eat raw, keeping till January.

The bell pool, which is a middle-sized apple, of a pale-green colour, streaked with red towards the fun. It is a good apple, in eating from January to April.

The black apple, which is a middle-sized fruit, of a dark mahogany colour next the fun, but fainter on the other side. It is of a pleasant sweet taste, keeping till the middle of April.

The Bland's summer pippin, which is a handfome apple, of a gold colour, and an agreeable flavour. It is a great bearer, ripe in September, and keeps till Christmas.

The Blatche's fine small table apple, which is about the fize
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size of a small golden pippin; red toward the fun, and green on the other side. It has a fugary taste, and comes into eating in January.

The boomery, which is a pretty large handsome apple, of a flat shape, and deep-red colour; and the flesh is streaked with red. It is not fit to eat raw, but will do well for cyder, or for the kitchen. It keeps till April.

The Bovey redstreak, which is a handsome apple, of a flatish shape, beautifully streaked with a bright red next the eye, which is small, and of a yellow colour about the footstalk. It keeps till the latter end of October.

The broad-eyed pippin, which is a fine large apple, with a very large eye; the colour is a greenish-yellow, with a little red toward the fun. It is a good apple, and keeps till May.

The brandy apple, which is about the size of a golden pippin, flat-shaped, and of a yellowish ruflet colour. It is of a pleasant flavour; comes into eating in January, and keeps till March.

The hardoff, or queen's apple, which is a beautiful fruit, red next the fun, and of a fine yellow on the other side. It is a very fine apple; in Mr. Forfey's opinion, next in perfection to the golden pippin, and about the same size. It is of a good flavour; ripening in January, and keeping till March.

The carнятие apple, which is a beautiful middle-sized fruit, finely striped with red. It is ripe in January, and keeps till May.

The Carbury pippin, which in size and shape resembles the French crab, and is of a deep green colour. It is a good baking apple, keeping till March.

The caraway rufflet, which is a handsome rufflet-coloured apple, about the size of a nonpareil.

The calville, red and white, which are good apples, and of a vinous taste. Some have a red and fome a white pulp, the white being reckoned of a most delicious taste. They are in eating in September, and the following month.

The cat's-head, which is a large oblong apple, of a greenish-yellow colour, with a little brownish-red next the fun; sometimes the colour inclines to a rufflet. It is a good baking apple, and is in eating from October to December.

The cockagee, which is a conical-shaped middle-sized apple, red on that side next the fun, and of a fine yellow colour on the other. If properly managed, the fruit keeps till February. It is a famous cyder apple, and also bakes well.

The codlin, which is generally the first apple that is brought to market. Its fruit is so well known that it needs no description. It is in eating from July to December; and is good either for baking or boiling.

The Cornish nonpareil, which is rather under the middle size, is a little flattened, and of a rufflet colour. It is a very good apple, and keeps till the middle of March.

The Cornish pearmain, which is of a middling size, and long shape; of a dull-green colour on one side, and rufflet on the other. It is a very good apple, and keeps till the latter end of April.

The Court-of-Wick pippin, which is described by Mr. Billinggley, in his "Survey of Somersetshire," as the favourite apple, both as a table and cyder-fruit, taking its name from the spot where it was first produced. It originated from the pip or fced of the golden pippin, and may be considered as a beautiful variety of that fruit. In shape, colour, and flavour, it has not its superior: the tree is large, handsome, and spreading, and a very luxuriant bearer. On the whole, it cannot be too strongly recommended. It is larger than the golden pippin, of a yellowish-green colour, and a little tinged with red next the fun. It comes into eating in January.

The Cockles pippin, which is a handsome oval-shaped apple, below the middle size, of a ruflet colour, mixed with yellow and red. It keeps till April.

The corpendu, or hanging body, which is a very large apple, and has a red callet on the side towards the fun; but is pale on the other side. It takes its name from always hanging downwards; and comes into eating in September.

The Dalmahoy pippin, which is about the size of a golden pippin, of a green colour, and a little streaked with red toward the fun. It has a tolerably good flavour, rather sharp; and is in eating from September to February.

The Dimock's red, which is under the middle size, of a fine red colour, intermixed with a little yellow on the side from the fun. It is ripe in January, and keeps till March.

The Dredge's seedling, which is a fine large apple, striped with red next the fun, and of a yellowish-green on the other side. This is an excellent kitchen apple, of a pleasant taste, and keeps till the latter end of January.

The Dredge's beauty, which is a beautiful apple, of a good size, and one of the finest yet known in point of general utility. It is of a fine bright yellow colour, spotted with red towards the fun; and has an excellent vinous flavour. It is good either for the table or baking, and keeps till March.

The Dredge's rufflet, which is a small apple, of a greenish-yellow rufflet colour, and of a pleasant flavour. It is ripe in November, and keeps till Midsummer.

The Dredge's white lily, which is a fine apple, of an exceeding high flavour, and keeps till March.

The Dredge's fair maid of Wiltshire, which is a fine middle-sized apple, of a yellowish-green colour, with some rufflet next the fun, of an excellent flavour. It is a great bearer, and is in eating from Christmas to Easter, being an excellent dessert apple.

The Dredge's queen Charlotte, which is a beautiful middle-sized apple, of a gold colour, with red towards the fun. It is of an excellent flavour, comes into eating about Christmas, and keeps till February.

The Dredge's fame, which is a good sized apple, red towards the fun, and streaked like the Ribston pippin on the other side. It is a most excellent apple, being in eating from Easter to Midsummer.

The dumpling apple, which is a handsome apple, and rather above the middle size, flat-shaped, and of a greenish-yellow colour, with some faint streaks of red. It keeps till March.

The Dutch queening, which is a large apple, somewhat resembling the cat's-head in shape. The colour is red next the fun, and green on the other side, with sometimes a little red. The fruit is fit only for the kitchen, and for making cyder. It is ripe in January, keeping till the end of March.

The Elton's yellow kernel, which is a handsome middle-sized apple, of a yellow colour. It is a good table apple, being in eating from January to March.

The English rennet, which is a handsome apple, beautifully streaked with red, but darkish towards the fun; of a tolerable flavour, but apt to grow mealy when kept too long. It keeps till the middle of May.

The embroidered apple, which is pretty large, and the stripes of red very broad, from which circumstance it takes its name. It is commonly used as a kitchen apple, becoming ripe in October.

The everlasting striped apple, which is below the middle size,
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fize, of a conical shape. The colour is a striped green towards the footstalk, and red towards the eye.

The famous, which is a pretty large apple, of a beautiful dark red, with a little yellow on the side from the fun. Its flesh is very white, and full of a rich sugary juice; coming into eating about the latter end of October. It was introduced from Canada by Mr. Barclay of Brompton.

The fenouillet, ou pomme d'anis, the fennel or anise apple, which is a middle-sized fruit, of a grey colour; the pulp is tender, and has a spicy taste, like aniseed. It becomes ripe in September and October.

The flower of Kent, which is a large handsome apple, of a yellow colour, and pretty good flavour. It keeps till the middle of April.

The fox-whelp, which is a small apple, streaked with red. It is ripe in January. It is a cyder apple.

The Franklin's golden pippin, which is a handsome middle-sized apple, of a conical shape and gold colour, beautifully marked with dark spots. The fruit has a fine aromatic flavour, and preserves the first place at the table; but it is a very fine bearer. It comes into eating about the middle of November.

The French crab, which is a large handsome apple, of a deep green colour, with a little red next the fun. It will keep all the year; is a good baking apple, and, if the summer be warm, pretty good for eating, and is a great bearer.

The French coxkin, which is a pretty large apple, of a conical shape, and green colour, with red towards the fun, coming into eating in January.

The Fearn's pippin, which is of the shape and size of a nongenerated. It is of a beautiful scarlet next the fun, and of a golden yellow on the other side. It makes a fine flow at table, and keeps till the latter end of February.

The French Spanish, which is a large apple, in form of a hexagonal prism with the angles a little rounded, and of a yellowish-green colour; it is pretty good, and keeps till the latter end of April.

The French or white rennet, which is a large fruit, of a yellowish-green colour, with some grey spots. It has a sugary juice, and is good either for eating or baking.

The Garguey pippin, which is a handsome conical-shaped apple, under the middle size, of a greenish-yellow colour, with a little red towards the fun. This is a pretty good apple, and keeps till May.

The gilliefower, which is a fine handsome apple, red towards the fun, and of a yellowish-green on the other side, having a fine flavour, and keeping till the latter end of March.

The golden rennet, which is a beautiful apple, a little flattered; of a fine red colour towards the fun, and yellow on the other side. It is a good eating apple, and keeps till February.

The golden pippin, which is a fine middle-sized apple, of a golden rennet colour, from which it takes its name. It is a good apple, and keeps long.

The golden pearmain, which is a fine apple, above the middle size, of a fine deep red towards the fun, with a little yellow on the other side; when much exposed to the fun it is sometimes red all over.

The golden Mundi, which is a fine handsome apple, beautifully streaked with red; of a good flavour, excellent for baking, and will keep till January. It is a good sauce apple.

The golden Glocester, which is a handsome middle-sized apple, of a flat shape, and gold colour, with red towards the fun. It is a good apple, and keeps till March.

The golden Knob, which is a handsome though rather small apple, of a fine gold colour, sometimes inclining to a russet. It has a pleasant flavour.

The golden pippin is well known; and the French own it to be of English origin. It is almost peculiar to this country; for there are few countries abroad where it succeeds well. It is yellow as gold; the juice is very sweet; the skin (especially where exposed to the fun) is often freckled with dark yellow spots. It is certainly the most ancient, as well as the most excellent, apple that we have. It ripens in October, and keeps through the winter. It has several sub-varieties.

The Godolphin apple, which is a very handsome large fine fruit, streaked with red on the side next the fun, and of a yellowish colour on the other side. It is in eating from the latter end of September to December.

The green dragon, which is a fine large apple, of an excellent flavour, and pale-green colour. It is rather too large for the table, and is therefore mostly used as a kitchen apple. It keeps till March.

The great or large russet, which is a middle-sized fruit, of a russet colour, with a little dark-red toward the fun. A pretty good apple, and keeps till April.

The Griddleton pippin, which is a large angular-shaped apple, of a greenish colour, with a little blush towards the fun. It is a baking apple, and keeps till March.

The Grumna's pippin, which is about the size and shape of a golden pippin; of a dingy-green colour next the fun, and of a dull yellow on the other side. It is ripe in January, and keeps till April.

The Hagloe crab, which is a yellow-coloured conical-shaped apple, below the middle size. It is ripe in January; but it is only fit for making cyder, or for baking.

The half-door, which is a fine large apple, of a flat shape, beautifully streaked with red toward the fun, and of a greenish-yellow on the other side. It is of a fine flavour, and is in eating from January till March.

The Hallingbury, which is a large flat-shaped apple, with large ridges from the base to the crown. It is of a beautiful red toward the fun, and of a yellowish colour on the other side and towards the eye.

The Hampshire nonsuch, which is a pretty large well-shaped apple, of a greenish-yellow colour, streaked with red. It keeps till the latter end of November.

The Harvey's russet, which is so called in Cornwall, is a large russet-coloured apple, with a little red toward the fun. It is a famous kitchen fruit, and tolerably good raw, with a mealy flavour.

The Holland pippin, which is a middle-sized apple of a flattish shape. Its colour is yellow, in some places inclining to green, with, sometimes, a little red toward the fun. It is a pretty good apple, keeping till the middle of April.

The hollow-eyed pippin, which is a middle-sized apple, of a yellow colour, beautifully spotted with red toward the fun; and the eye is pretty deep. It is a good sharp-flavoured apple, keeping till the middle of May.

The hollow-eyed rennet of Cornwall, which is a handsome flat-shaped apple, under the middle size, of a greenish-yellow colour, sometimes intermixed with russet. It is of an excellent flavour, and keeps till April.

The hedge apple, which is a new fruit, of middle size and handsome conical shape, red toward the fun, and of a straw colour on the other side. It is of a tolerably good flavour, and keeps till the latter end of April.

The hoghead apple, which is a small red fruit; the flesh is red, and the tallow amber. It is a cyder apple, becomes ripe in January, and keeps till March.
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The Hubbard's, or the ruflet pearmain, which is a real Norfolk apple; and, though not handsome, is one of the best table apples. It is of a dark ruflet colour, becomes ripe in January, and keeps till April.

The John apple, which is a middle-sized handfome fruit, of a greenish-yellow colour, with a little red toward the fun; the foottalk being very small. It is an excellent cyder and baking apple, from Devonshire; it is of an excellent flavour, and keeps till March.

The Isle of Wight pippin, which is a handfome middle-sized apple, of a greenish-yellow colour.

The juneting, or jenneting, which is a small yellowish apple, red on the side next the fun. It is a pretty fruit for early variety, and ripens about the latter end of June or beginning of the following month.

The kernel redbreak, which is of a greenish-yellow, with broad flecks of a dark-red all over it, and a yellow ground finely speckled with red next the fun.

The kernel pearmain, which is a small handfome apple, red toward the fun, and of a yellowish-green mixed with red on the other side. It is of a good flavour, keeping till the middle of May.

The Kentish pippin, which is a handfome sized apple, finely flecked with red. It is of a fine flavour, comes into eating about Christmas, and keeps till February.

The Kentish nonpareil, which is a handfome flat-shaped apple, of a light-ruflet colour, inclining to red toward the fun. It is of a good flavour, and keeps till May.

The king of the pippins, which is a middle-sized apple, of a fine gold colour, a little flecked with red toward the fun. It is ripe in January, and keeps till the latter end of March, when it becomes mealy.

The king apple, which is a middle-sized apple, of a conical shape; and its colour is that of a beautiful red intermixed with a little yellow on one side. This apple is of a pleasant fugitive taste, and keeps till the latter end of April.

The Kirke's feeding, which is a beautiful apple of a fine red colour towards the base, and yellow towards the eye. The foottalk is slender, and the eye large.

The Kirke's scarlet pearmain, which is a handfome middle-sized apple, of a beautiful red toward the fun, and a little yellow on the other side; becoming ripe in January.

The Kirke's scarlet admirable, which is a good apple for baking, and of a beautiful scarlet colour, is in eating about the month of January.

The Kentish full-basket, which is a species of codlin, of a large fize, and generally used for baking. It is in eating from August to October.

The Kirton or crack'd pippin, which is a middle-sized apple, of a greenish-yellow colour, with little dark spots. The coat is generally rough towards the foottalk. It is a good apple for the table, coming into eating in September.

The lady's finger, which is an excellent table apple, of a conical shape; red next the fun, and of a yellowish cast on the other side, having a sweet pefianflavour, and keeping till May.

The large flyre, which is a handfome cyder apple, of a yellow colour, with a little red next the fun. It becomes ripe in November.

The Lisbon pippin, which is a handfome middle-sized apple, of a flat shape, a fine red toward the fun, and a reddish-yellow on the other side. The flesh is firm, and has a sharp pefianflavour. It comes into eating in November.

The Loan's pearmain, which is a large oval-shaped apple, of a dull green colour intermixed with a brownish-red, deepest next the fun. It is a pretty good table apple, of a sharp taste, ripening in September, and keeping till May, but is apt to grow mealy.

The London pippin, or five-crowned pippin, which is a fine large apple, of a green colour, flecked with red toward the fun. It resembles the Ribblon pippin, but is larger. It has a pretty agreeable taste; and will come into eating about the latter end of November. It is good for the kitchen and table; and a most abundant bearer. It keeps till the middle of April.

The le calvingle d'automne, the autumn calvingle, which is a large fruit, of an oblong figure, and of a fine red colour toward the fun, having a vinous juice, and is much esteemed by the French.

The long laller, which is a middle-sized apple, of an angular shape, and fine yellow colour, with a beautiful red next the fun. It is of a tolerable flavour, and keeps till the middle of May, but is apt to become mealy.

The lemon pippin, which is a handfome oval-shaped apple, of a gold colour. It is of a fine flavour, and will keep till the beginning of March.

The long feam, which is a large angular-shaped baking apple of a pretty good flavour, with light green colour. It keeps till the latter end of January.

The lord Cheney's green, which is a middle-sized Yorkshire apple, resembling the Yorkshire greening. It is of a dark green colour, with a little of a chocolate colour next the fun. It is a baking apple, and keeps till the middle of May.

The lord Arundel's apple, which is large, of an angular shape; the colour is green, with a little dingy red toward the fun. It is from France, and good for sauce, keeping well.

The lord Camden's remnet, which is a good-sized feeding, of a yellow colour, with a little brownish-red next the fun. It is a good flavoured apple, and keeps till March.

The Lucas's pippin, which is a handfome, middle-sized, cylindical-shaped apple, of a beautiful orange colour. It is a pretty good fruit, and keeps till the latter end of April.

The maiden's blush, which is a small apple, of a dark mahogany colour next the fun, but paler on the other side, and sometimes of a greenish cast. The tale is soft, and of course this fruit is not fit for the table; but does very well for baking, or for cider. It keeps till the beginning of March.

The Mansfield tart, which is a large Nottingham apple, but most known in Yorkshire. It is handfome, of a green colour, having a little call of brownish-red, with dark spots next the fun, being a baking apple, and keeping till February.

The May gemnet, which is rather under the middle size, of a greenish-yellow colour, slightly flecked with red next the fun. It keeps till April.

The major Hemmings's apple, which is a handfome middle-sized fruit, of a light green colour, with a little brownish-red toward the fun. It is an excellent apple.

The margil, which is an excellent apple, about the size of a nonpareil. It is of a red colour, with some yellow on one side; continues in use from November to the latter end of March; and is often fold in the London markets for a nonpareil.

The Margaret apple, which is a fine and beautiful fruit, yellow, striped with red, of a delicate taste, sweet scent, and generally eaten off the tree. It is ripe in August.

The Minchall crabb, which is a handfome middle-sized Lancashire apple, of a yellow colour, with some brown spots.
It is common in the Manchester markets, and keeps till April. The monstrous rennet, which is a very large apple, turning red towards the fun, and of a dark green on the other side. It is generally preferred on account of its magnitude, as the flesh is apt to be mealy. It becomes ripe in October.

The mother rennet, which is rather under the middle size, of a greenish colour, with a little bluish towards the fun. The eye is large and deep, and the footstalk small.

The New-England pippen, which is a large angular-shaped apple, of a greenish colour, with a little brownish-red towards the fun. It has a pretty good flavour, and keeps till March.

The Newton pippen, which, according to Mr. Forfyth, is an American apple, but said to be originally from Devonshire. It is a fine large apple, of a greenish-yellow colour and red, with dark spots next the fun. When much exposed, it is of a beautiful red towards the fun, and of a gold colour on the other side. It has a fine flavour when not kept till it is too ripe, as then it becomes mealy. It is in eating from November to January.

The new red mul, which is a fine large apple, of a pale red towards the footstalk, and of a greenish colour towards the eye. It is a cider apple, and fit for baking.

The new red pippen, which is a beautiful middle-sized apple, of a darp red colour, with a mixture of yellow on the side from the fun. It keeps till March.

The nufuch, which is a good bearer, and very fit either for the table or kitchen; the cooks, however, complain that it makes but a very small proportion of sauce. It is ripe in September and October.

The nine-square, which, according to Forfyth, is a Gloucestershire apple. It is a large angular-shaped fruit, of a fine red towards the fun, and yellow on the other side, with a small mixture of red, keeping till April.

The Norfolk colman, which is a middle-sized apple, of a mahogany colour towards the fun, and a dark green on the other side. It keeps till August.

The Norfolk beethin, which is a good-sized apple, rather flattened, of a deep red colour towards the eye, but paler towards the footstalk.

The Norfolk paradise, which is a large apple, of a dark red colour towards the fun, and green on the other side. It is a nice baking apple, and of a tolerable flavour for eating. It keeps till the middle of May.

The Norfolk barber, which is a pretty large apple, of a dark red colour towards the footstalk, and green towards the eye. It is of a pleasant sharp flavour, being in eating from the latter end of January to the latter end of April.

The northern greening, which is a fine oblong apple, full at the footstalk, of a pale green colour, with a little red towards the fun. It is nearly of an equal size from the base to the crown, and has a fine flavour, being ripe in January.

The nonpareil, which is a fruit deferredly valued for the brilliantry of its tale. It is seldom ripe before Christmas, and, if well preserved, will keep till May. It is justly esteemed one of the best apples that have been yet known. The oak peg, or oaken pin, which is an oval-shaped middle-sized fruit, of a green colour striped with white. It is very full towards the footstalk, which is small, keeping till June.

The old English pearmain, which is an oval-shaped apple, of a middle size, and fine red colour, with a little yellow towards the eye. It is of a pleasant sweet flavour; and is in eating from January to March.

The old red mul, which is a fine large apple, somewhat resembling the new red mul, both in shape and colour, with the addition of dark red spots towards the footstalk.

The old red pippen, which is a middle-sized apple, red towards the fun, and of a greenish colour on the other side. It is a good apple, and keeps till March.

The orange pippen, which is about the size of a large golden pippen; of a beautiful gold colour, with a little pale red towards the fun. It is a handsome apple, of a good flavour, and makes a fine appearance at table, being in eating in October, and keeps till March, but gets flat in the table when too long kept.

The Orleans pippen, which is a small flat-shaped apple, of a dark red colour, resembling the Orleans plum.

The paradise pippen, which is a handsome middle-sized apple, of a reddish cast. It comes into eating in October, but will not keep. It grows mealy when too ripe.

The pashen, which is below the middle size, of a conical shape, and of a greenish-yellow, or light green colour. It is ripe in January.

The Pile's russet, which is a middle-sized longish-shaped apple, russet about the footstalk, yellow towards the middle, and of a brownish-red about the eye. It is a very firm fruit, of a sharp acid flavour, being much esteemed for baking. It ripens in October, and will keep till April.

The pigeonette, which is rather below the middle size, of a conical shape. It is of a pink colour, pretty dark towards the fun.

The Pearson's pippen, which is a nice apple, about the size of a large golden pippen, of a yellowish colour, and the form a little flat. In Devonshire, according to Mr. Forfyth, they put these pippens into the oven just after the bread is drawn, laying a weight over them to flatten them, in the same manner as they do the beets in Norfolk, and bring them to table as a sweetmeat. It is a very good dessert-apple, and keeps till March.

The pomme grise, which is a fine apple, from Canada, of a flatish form, and russet colour, streaked beautifully with red. It ripens late, and keeps till March. It is an excellent eating apple.

The pomme d'api, which is much valued for its colour, being a bright red. The tree is a good bearer, and the fruit is not subject to be shaken with high winds. The fruit should be suffered to hang on the tree till October or November, if the fruit do not set in. It comes into eating in February and March, and keeps long; but is more admired for its beauty than its flavour, or fineness of table.

The pomme violette, the violet apple, which is a pretty large fruit, of a pale green, striped with red towards the fun. It has a sugary juice, and a flavour of violets, from which it takes its name. It ripens in October, and continues in eating till February, or later.

The pommy, or king's apple, which ripens nearly as soon as the juneting, and though not so beautifully covered, is larger and much better raffled. It has a sub-variety, which is a winter apple.

The pound pippen, which is a large handsome apple, of a greenish colour, and is good for baking. It becomes ripe in January.

The poor man's profit, which is a dingy coloured oval-shaped apple, below the middle size. It is raised freely from cuttings; and keeps till January.

The queening, which is from Gloucestershire, is a large apple, of irregular shape, having large ridges from the base to the crown. It is of a dark red, but deepest towards the fun. It is a good cider apple, and bakes well, keeping till the latter end of November.
The queenie's kernel, which is a fine apple, above the middle size, of a deep red colour. Covered very thick with small whitish specks. It is a tolerably good apple, and keeps till the latter end of April.

The queenie's kernel, which is a small handsome apple, of a yellowish-green colour, sometimes inclining to red on the side next the sun. It is a fine-flavoured apple, very fit for the table, coming into eating in January, and keeping till May; but is apt to grow mealy when kept too long. Mr. Forthys says, "the tree never grows to the height of other apple-trees."

The quince-apple, which is a middle-sized fruit, of a yellow colour, with a little red towards the eye. It is of a pleasant sharp flavour, ripe in January, and keeps till April.

The Ramborn, which is a large fruit, of a fine red next the sun, and striped with a yellowish-green. It ripens about the middle of September.

The red pearmain, which is smaller than the pear mains in general. It is of a deep red, with a little yellow on one side. A pleasant sweet apple, and keeps till the middle of April.

The red-streak, which is a handsome middle-sized apple, beautifully streaked with red. It is a good cider apple, becoming ripe in January.

The red-streaked feldling from Longleat, which is from the Dorsetshire red-streak, is a beautiful apple, of a yellow colour, streaked with red, particularly next the sun. Forthys says, it is sold in the Bath and Bristol markets in the latter end of September, and beginning of October. It is a pretty good apple, but does not keep long.

The red bag, which is a beautiful large Herefordshire apple, of a longish shape, streaked all over with a dark red; and is in eating about the middle of October.

The red mutt, which resembles the old red mutt in shape; but is of a dark red colour towards the sun, and yellow on the other side. It is ripe about the middle of November.

The rennette grive, which is a middle-sized fruit, of a grey colour next the sun; it is a very good juicy apple, of a quick flavour, and ripens about the latter end of October.

The red sweet, which is a small round apple, red towards the sun, and of a greenish-yellow on the other side. It is a good bearer, according to Forthys, "and much esteemed among the country people of Cornwall, for making a kind of tart or pie, one of their dainties at Christmas." It is a pretty good table apple, and keeps till March.

The Ribston pippin, which is a fine apple, from Ribston Hall, near Knareborough, in Yorkshire. It is a little streaked with red towards the sun, and yellow on the other side, being one of the best apples for eating and baking, and continues in use from the end of October till April. It bears very well as a dwarf, and no garden should be without it.

The Robinson's pippin, which is about the size of a golden pippin, of a green colour, and partakes of the flavour both of a golden pippin, and a nonpareil. It keeps till May.

The royal George, which is a fine large apple, of a beautiful yellow on one side, and green on the other. It is a good apple, and keeps till June; but then grows mealy.

The royal nonpareil, which is a handsome apple, of a flatish shape, with a small footstalk and fine eye. It is about the size of a common nonpareil, of a green colour, with red towards the sun. It is ripe in January, and keeps till the latter end of March.

The royal pearmain, which is a fine large apple, beautifully streaked with red. It is ripe in January, and keeps till March, being a pretty good apple.

The royal ruffet, or leather-coat ruffet, which is a large fruit, and one of the best kitchen apples that we have. It is also a pleasant eating apple, and a great bearer, being in use from October to April.

The ruffet pippin, which is of a rough ruffet colour towards the sun, and of a green colour, sometimes inclining to yellow, on the other side. It is a good keeping apple, and fit either for baking or eating raw. It is ripe about the beginning of February, and keeps till March.

The summer pearmain, which is striped with red next the sun; the flesh is soft, but soon turns mealy; so that it is not much esteemed. It is in eating in August and September.

The silver pippin, which is a handsome middle-sized conical-shaped apple, of a fine yellow colour, with a faint blush towards the sun. The flesh is firm and very white, and of an excellent flavour. It keeps till the middle of May, or later.

The seek no farther, which is a handsome apple, rather above the middle size, of a pale green colour, a little streaked with red. It is of a pleasant though not very high flavour; and is in eating from January to May; but is apt to be mealy when kept longer than the beginning of April.

The Sykehouf, which is a handsome middle-sized apple, from Sykehoufe in Yorkshire, of an orange colour towards the sun, sometimes inclining to red, and yellow on the other side. This is a fine eating apple; ripe in January, and keeps till April.

The flone pippin, which is of a green colour, streaked with red towards the sun. It is of a sharp taste, and is in eating from January till the middle of May.

The Stoup codlin, which is a large handsome apple, of a pale-green colour, with a little red towards the sun. It is a baking apple, of a pleasant taste, and keeps till May.

The striped nonpareil ruffet, which is a handsome apple, of a greenish-ruffet colour, with a little brownish-red towards the sun. It is about the size of a large nonpareil, is ripe in January, and keeps till March.

The spice apple, which is a handsome middle-sized angular-shaped apple, of a yellow colour, and a pleasant flavour. It is ripe in January, and keeps till March.

The Skerry's kernel, which is a conical-shaped middle-sized apple, beautifully streaked with red, deep (or) towards the eye, and having a good deal of yellow towards the footstalk. It is ripe in January, and keeps till March.

The spice rennet, which is a handsome apple, below the middle size, red towards the sun, and yellow on the other side.

The Spanish pearmain, which is a middle-sized oblong apple of a carmine colour, and dark-red towards the sun. It is a pretty good apple, and keeps till the beginning of May.

The Spanish onion, which is a handsome round apple of a ruffet colour, with a dull red towards the sun. This apple, which is rather below the middle size, is very good for dessert, keeping till March.

The Sharp's ruffet, which is below the middle size, of a brownish-red colour towards the sun, and a pale-green on the other side. It is shaped like the fructum of a cone; is of a pretty good flavour; and keeps till May.

The Spencer's pippin, which is a middle-sized apple, of a yellowish colour, with many dark spots, being a baking apple, and keeping till the middle of May.

The Tunkerton, which is a conical-shaped yellow apple, with sometimes a little blush towards the sun. It is an excellent
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excellent sauce apple, and bakes well, being of an agreeable taste, but too large for the table. It will keep till February.

The transparent apple, which was introduced from St. Petersburg; but it is more curious than useful: a tree or two, therefore, will be sufficient for a garden. It ripens in September or October.

The Trevoird rennet, which is a small handsome russet-coloured apple, of an excellent flavour, and will keep till May.

The white corpendu, which is a middle-sized long-shaped apple, of a yellowish colour. It is a good eating apple, and ripens in January.

The ward apple, which is a beautiful flat-shaped apple, rather below the middle size, of a fine red towards the eye, and of a yellowish-green towards the footstalk. It is a sharp flavoured fruit, and keeps till June.

The Wheeler's ruffet, which is of middling size, the flesh firm, and of a quick acid flavour; it is an excellent kitchen fruit, and keeps long. It ripens in October.

The wine ruffet, which is a middle-sized conical-shaped apple, of a dark russet colour, and sharp flavour. It keeps till the latter end of April.

The Wheeler's extreme, which resembles the pomme grise, and is about the size of a nonpareil. It is a flat-shaped apple, beautifully clouded with red on a yellowish-russet ground; is of an excellent flavour, and keeps till April.

The white mulf, which is a middle-sized handome apple, of a greenish-yellow colour, with a little red towards the fun; the flavour is rather tart, but agreeable. It is ripe in January.

The Whitmore pippin, which is a good-sized handome apple, streaked with red towards the fun, and of a pale-yellow on the other side. It has firm flesh, of a tolerably good flavour, and is in eating from November to the latter end of April, or later.

The Wiltshire cat's-head, which is a large handsome apple, red towards the fun, and green on the other side. It is a very fine baking apple, and of a good flavour, being ripe in January.

The winter pearmain, or Herefordshire pearmain, which is of a fine red next the fun, and striped with red on the other side; the flesh is juicy, and flows well. It is fit for ufe in November, and, if properly managed, will keep till the latter end of March.

The winter pomroy, which is a pretty large conical-shaped apple, of a dark-green colour, a little streaked with red towards the fun. The coat is rather tough. It is a good baking apple, keeping till January.

The winter box apple, which is a middle-sized fruit, of a light green colour, and keeps till February.

The woodcock, which is a good-sized apple, of a dark red next the fun, and paler, with a little mixture of yellow, on the other side. It is ripe in January, and keeps till March, being a good cider apple.

The Wright's nonpareil, which is a Salopian apple, being a great bearer, of a good size, and a little flattened. It is a good kitchen apple, and keeps till June. The tree is smaller in size than most other apple-trees.

The Yorkshire greening, which is a good-sized flattened apple, of a dull-red colour, with a little green towards the eye. It keeps till August, or often later.

The sorts of apples advised for a small garden are the following: the juneting, the golden pippins, the nonufch, the Ribiton pippin, the nonpareils, the queen's apple, the Sykehoufe, the golden renant, the aromatic pippin, the grey Ledington, the scarlet pearmain, the lemon pippin, the pomme grise, the French crab, and different sorts of ruffetins and codlins, for baking.

But there are other varieties and sub-varieties that may be equally valuable with many of the above sorts.

Of the sixth sort there are the following sorts: the pear quince, with oblong-ovate leaves, and an oblong fruit lengthened at the base; the apple quince, with ovate leaves and a rounder fruit; the Portugal quince, with obovate leaves, and an oblong fruit, which is more juicy and less harsh than the others, and therefore the most valuable.

The quince is a very beautiful tree when in flower, as well as when the fruit is ripe in the autumn, and was cultivated in this country at an early period. According to Mr. Forfathy, the best sort for planting in the fruit-garden is the Portuguese, being the fittest for baking or stewing. It is of a fine purple colour when dried, and is much better for marmalade than any of the other sorts. The oblong kind, and the apple quince, are also planted in these situations, and other sorts are employed in the shrubberies for producing variety. The above sorts are like-wise valuable for mixing with apples in making pies, puddings, &c. as they add a quickness to the flavour when flat.

Method of Culture in the Pear Kind.—These trees are raised by grafting and budding upon any kinds of pear stocks; occasionally upon quince stocks; and sometimes upon white-thorn stocks; but the first sort are preferable for general use to have large trees, and the second for moderate growers.

The numerous varieties of these trees having been first accidentally obtained from seed, and as these seedlings rarely produce the same sorts again, the approved kinds are continued and increased only by grafting or budding upon stocks raised from the kernels of the kinds just mentioned. In order to refrain the growth of these trees, white-thorn stocks have also been used; but these are not so generally successful, and are almost in total diffuse in the nurseries: of course pear stocks are proper for general use, for principal large trees, both for walls, espaliers, and standards; and quince trees for smaller growths. For raising the stocks, the seeds or kernels of the different sorts should be sown in the latter end of autumn, as November, or December, or early in the spring, in beds of light earth, covering them near an inch deep; they come up in the spring; and in autumn, winter, or spring following, the strongest should be planted out in nursery-rows to remain for grafting and budding, for which, after having from one to two or three years' growth, they will be of proper size.

The operations of grafting and budding should be performed in the usual method; the former in the spring, and the latter in summer. (See Grafting and Budding.)

For this purpose the grafts and buds should be procured from such trees as produce the finest fruit of the respective sorts; those designed as dwarfs for walls, espaliers, or standard-dwarfs, being grafted or budded near the bottom; and in those for half or full standards, the stocks may either be previously trained up from three or four to seven or eight feet high to form a stem, then grafted near the top, or be grafted low-in the stock, like the dwarfs, and the first main shoot trained for a stem the above height: the grafted trees, both dwarfs and standards, should be pruned in their first year, but the budded ones not till the spring after; and when their heads are two years old from the grafting and budding, they may, if thought proper, be planted out for good, or remain longer in the nursery, as may be found convenient.

The dwarfs for walls, espaliers, &c. whether they remain longer in the nursery, or be transplanted to a year old into the garden, should have the first shoots from the graft or bud,
bloom, when a year old, headed down in March to five or six
eyes, to force out a proper supply of four, five, or more
lateral branches near the ground, to furnish the wall or
capital with borders quite from the bottom, these readily
producing others to cover the upper part.

Standards, supposing them to be grafted on high stocks,
may either be headed near the top of the stock, or permitted
to run up, as the case may require, so that if shortened it
will force out laterals near the head of the stem, and form
a more spreading full head; and if suffered to run up with
the first shoots entirely, they form higher and generally more up-
right heads in the end. Such standards, however, as are
grafted or budded low in the stock, as for dwarfs, must
have the first shoots trained upright at full length, fix or seven
feet high for a stem; if for full standards, they may either
be topped at fix feet height, to force out laterals near that
part to form a spreading head, or suffered to run and branch
in its own way to form a more erect and higher head.

The headed trees, both dwarfs and standards, on being
cut down in the spring, soon branch out from all the eyes
immediately below; when care should be taken during the
summer to trim off all shoots from the stem, suffering all
the top shoots to remain entire; when they will form hand-
Some beginning young heads by the end of summer, and in
autumn, winter, or spring following, may be finally planted
out into the garden, &c.

When from necessity they are retained longer in the nur-
ery, the whole should have proper pruning to reform ir-
regular growths, the proper trees being trained accordingly,
suffering the whole to branch away at full length, not
shortening any after the above general heading down, when
a year old, except it should form occasionally necessary,
either to reduce any casual irregularity, or to procure a
more full supply of lower branches; after which no further
shortening should be practised to the foot of trees;
for, after having obtained a proper set of regular branches
near the head of the stem, they readily furnish more in their
turn to increase the head on the upper part.

In regard to planting out the trees, they are moily of
proper growth for this purpose when from one to two to four
or five years old, from the graft or bud; but if larger trees
are required, those of six or eight years old may be safely
transplanted; younger trees, however, always succeed well,
even when only two or three years old.

In selecting pear-trees for planting, Mr. Forsyth advises
the choosing of the oldest trees that can be found instead of
the young ones, and such as have strong stems; to have
then carefully taken up, with as much of the roots as
possible, and carefully planted, after cutting in the roots a
little, spreading them as horizontally as can be done. Then
to fill up all round the roots with light dry mould; forcing
it in, about those which lie hollow, with a sharp-pointed
flick; filling the whole up to the top without treading the
mould, till the hole be filled with as much water as it
will contain, leaving it a day or two until the ground has
absorbed the water; then to throw on some fresh dry mould
and tread it as hard as possible, filling the hole up again
with mould to within an inch of the top, and giving it a
second watering, leaving the mould about three inches
higher than the border, to settle of itself, and to receive
the rain that falls, for at least a month. When the mould
has become quite dry, it may be trodden a second time;
then make a large bason all round the tree, and giving it
another watering, mulching the top over with some rotten
leaves or dung, continuing to water the trees once a week
in dry weather, and sprinkling the tops frequently with a
pot, or hand-engine, to keep the wood from shrivelling till
they have taken fresh root; and where the trees are planted
against a wall, the stems should stand sloping towards it; the
lower parts of them being fix inches from the bottom of the
wall, to give them room to grow, as when planted close to
the wall at bottom, the stems, in growing, will be confined
on the back, grow flat, and be very unsightly. If any
roots are in the way, to hinder it from being planted near
enough to the wall, they must be cut off; at the same time
taking care that the tree does not lean to either side, but
that, when viewed in front, it appear perfectly upright.
Sometimes standards and half-standards are seen planted a
foot or two from the wall, which gives them a very dif-
agreeable appearance; fix inches is, he thinks, quite suffi-
cient. Much care should be taken not to wound the stem
or root of the tree in planting.

When young trees have two stems, he advises always to
cut off one of them, leaving the stoutest and straightest,
planting that side outwards which has most buds on it.

It is added, that when the buds begin to break well, the
trees should be headed down to three or four eyes, to fill the
wall with fine wood, but never afterward, except the lead-
ing shoot to fill the wall, leaving the fore-highest shoots to
be pruned, as heretofore directed. He has had some trees
that had forty pears on them the second year, while some
of the same kind bore only eleven pears the fourteenth year
after planting, with the common method of prun"ing.
When such old trees as are recommended above cannot be pro-
cured, the stoutest and cleanest of the one-year's old grafting
should be provided. Where any of these trees become
stunted after a number of years, they should be headed down
as heretofore directed, which will bring them into fresh vigour
and fruitfulness. The proper season for planting them out
is any time in open weather from the end of October till
March, but the autumn or early winter are the most advan-
tageous periods. They succeed well in any common garden
soil, or good fertile orchard-ground, or field, that is not
very wet, or of a stiff or harden quality, but moderately
light and friable to the depth of one spade at least, and if
more the better. The ground should be prepared by proper
raking one or two spades deep, as the depth of good soil
will admit, wholly if for a full plantation, or only along
the place for each row of trees, in the place for each tree;
or only a hole for each tree at proper distances. The proper
distance for planting the dwarf fourts for walls or on cpa-
lizers, is for those on free flocks at not less than twenty feet, but if
twenty-five, or more, the better, especially if the walls be
rather low, &c. that there may be full scope to extend
their branches considerably in a horizontal direction, as they
will effectually fill that space, or even much more if it be
allowed them; but they are often planted much nearer to-
gether. It is however of importance to give the trees suf-
icient room, and the higher the walls the better, as is
evident by those trees growing against the ends of high
buildings, as they extend themselves very considerably
every way. Some plant cherry-trees or other moderate
fruit-trees in the intervals for a few years, till the
pears advance in growth and approach one another, when
they should be removed. They are to be planted in the
usual way, with their heads entire. See Planting.

However, for trees that are dwarfed by grafting or budding
uppon quince flocks, from fifteen to eighteen feet may be a
proper distance for planting, either for walls or cpa-
lizers. In respect to the distance at which pear-trees should
be planted against walls, it is observed by Mr. Forsyth that
when they are grafted on free flocks, such as colmers, pear
d'auche, crafanes, Pechafferies, virgouleufs, and winter
and summer bouchientos, it should at least be twelve yards
distant.
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distant from each other, supposing the walls to be from
twelve to sixteen feet high; but when they are only ten feet,
fifteen yards will be little enough for the purpose.

And where they are planted on south walls, vines, peaches,
nectarines, or apricots, may be planted between them, till
the trees extend so far as nearly to meet each other; then
they may be removed to any other situation in the garden
where they are wanted. And where the pears are planted
on west walls, the fame sort of trees may be planted between
them as on south walls; the fruit on a west aspect will come
into use to fecund that on the south. On an east wall dif-
ferent sorts of plums and cherries may be planted between
the pear-trees till they almost meet, then transplanted as
standards or wall trees.

It is advised that the borders for pear-trees in a large
garden should not be less than from ten to twenty feet wide,
with a foot-path about three feet from the wall, covered
over at top with coalashes or road-fand, to make a dry
walk for getting at the trees to cut and nail them, to gather
the fruit, &c. And that the depth of the mould for them
should never be less than three feet, laying the bell mould
at top, to encourage the roots to come as near the surface
as possible. If the bottom be clay, it will be very necessary,
once in every five or six years, to open the ground round
the roots of the trees, and cut off all the large ones that
are inclining to run into the clay; as, by this practice, the
trees will throw out fresh roots that will run near the sur-
face, provided the mould is good near the top of the borders.

And it is suggested that a crop of early peas, lettuces,
spinach, or any other small crops, may be grown on the
borders, during the winter and spring; but no late crops by
any means. If the ground can be spared, he would advise
have no summer crops, but keep the borders hoed, in
particular after rain; otherwise the ground, if a strong
loamy or clayey soil, will be apt to crack in dry weather;
but by frequent stirring between wet and dry this will in a
great measure be prevented, and the sun's rays admitted
into the mould, which will greatly heighten the flavour of
the fruit. When you can conveniently spare the borders
in winter, they should be ridged up to sweeten the mould,
which may be very well done if you sow early peas on the
sides of the ridges; which is by far the best way to preserve
the peas from the frost, and to prevent them from rotting,
which will sometimes happen, if the land be strong, before
they begin to vegetate; or, you may sow an early crop of
carrots or spinach on these borders.

With refer to the general management in the training
and pruning of these trees, if the young wall and espalier
trees thus planted are only one year old from the graft or
bud, having their first shoots of a year old entire, these
should in the spring be headed down to five or six inches, to
force out lower horizontal branches; but if they have been
previously headed, as advised above, and have thrown out
lateral true form a regular set of horizontal branches, con-
cfiting of fix or more near the bottom, they should not now be
shortened, but trained to the wall or espalier at full length
horizontally, preserving an equal number on each side five
or six inches and; they will readily emit a further supply
of horizontal shoots to cover the wall, &c. regularly up-
ward, and at the same time being shortened, they gra-
dually form themselves for bearing, as early shortening of
the branches of these trees retards their bearing a year at
least; if, however, there is a want of branches, some of
the middlesoft may be pruned short, and trained to the wall
or espalier. According as the trees shoot in summer, a
further supply of all the regular shoots in every part where
they occur, should be trained in at full length, unless it
shall seem necessary to prune some strong shoots to obtain a
greater supply of horizontal branches the same year, in
order to furnish the head as soon as possible; at this time,
however, displace all the fore-right and other irregular
branches of the year, continuing the supply of regular
shoots close to the wall, as they advance in length during
their summer's growth. And in the winter pruning, the supply
of shoots attained in summer should be well examined, fe-
ating all those that are well placed and properly situated
for training in, to increase the number of horizontal branches
on each side, which should be left wholly entire, and at the
same time retrenching any superfluous and ill-placed shoots
omitted in summer; then the whole supply of regular hori-
zontal branches in every part should be trained in straight
and close to the wall or espalier, equally on both sides of the
tree, every branch at the full length, at four, five, or six
inches apart. See WALL, ESPALIER-TREES, AND PRUNING.

But there is another method sometimes practised in training
these trees for walls and espaliers, which is, that after their
frist heading down, and having thrown out several laterals, to
select three of the strongest and most regularly placed, one
on each side and one in the middle, nailing the two sides
horizontally at full length, and the middle one upright:
the tree having produced a further supply of shoots in the fol-
lowing year, add two or four of them as side branches, arrang-
ing them on each side of the stem as the two former, train-
ing the middle shoot still in an upright direction; observing
that where it does not furnish horizontal slough enough, it may
be shortened fo as to make it throw out shoots at any requisite
height, continuing the middle one always upward for a stem,
and the side ones for bearers. In either of these methods of
training the trees, continue yearly increasing the number of
horizontal shoots, till the full space of walling or espalier is
regularly covered with bearers at equal distances, constantly
continuing them all at full length, as far as the scope of
walling, &c. will permit; as they naturally form fruit-spurs
at every eye, almost their whole length, and the fame branches
continue in a fruitful state a great length of time. When
the trees have once filled the wall or espalier with branches,
they need but very little further supply for many years,
and that only occasionally, according as any worn-out or decayed
branch occurs, and wants renewing with young wood. See
PRUNING.

And in the after-prunings in the summer, which should
e be begun in May, or early in June, rub off all the super-
fluous and unnecessary shoots of the year, and all fore-right
and other ill-placed shoots, retrenching them quite close,
being careful to leave the terminating shoot of every hori-
zontal or bearer entire; and referring here and there a well-
placed shoot, towards the lower parts in particular, and
where there are any apparent vacancies, to train up between
the mother branches, till winter pruning, when, if not wanted,
they must be retrenched.

But in the winter pruning, which may be performed any
time from the fall of the leaf until March, the branches
should be generally examined, to see if they are any where
too much crowded, or trained irregularly; and where any
such occur, they should be regulated as they may require;
and where there are any vacancies, some contiguous shoots,
referred in the summer dressing, should be laid in, and all
the other shoots not wanted must be cut clean out close to the
branches, being careful still to preserve the terminating shoot
of every branch entire, in all parts, as far as the allotted
space admits, like wise all the fruit-spurs in every part, fattening
in all the branches regularly at full length. In pruning
old trees at this season, where decayed and worn-out branches
occur, they should be cut out, and young wood trained in
its
its stead; likewise, where any branch, through age or any other defect, is become barren, it should be retrenched, and some eligible lower young branch, or shoot, be laid in its place.

Where any of the choicer sorts of these trees are become worn-out and barren, they should be renewed with young bearers, by heading the branches wholly down near the bottom in winter or spring, when they break out in the old wood, and in the following summer furnish a large supply of strong young shoots, which should be trained according to the rules already laid down, when they will soon form a fort of new tree, and bear good fruit. After each winter pruning, the trees which are again as it were and espaliers require a general nailing, &c. which should always be done with great regularity. See Wall-Trees, and Espalier-Trees.

The mode of training dwarf standard-trees of this sort is shown in speaking of trees of that kind. See Dwarf-Trees.

In respect to the culture of the borders where this sort of wall or espalier-trees are growing, it is commonly digging them once more every year, adding manure occasionally in common with the other parts of the garden; but if some good rotten dung be applied every other year, and the ground well dug or trenched every winter, it greatly promotes the size and perfection of the fruit. In regard to standard-trees of this kind, any of the forts bear plentifully in any open situation, though the fruit may not always be so large and fine as those of wall and espalier-trees: summer and autumn pears, however, ripen in great perfection on standard, as also most of the common winter pears. In planting them, trees of from two or three to four or five years old, having tolerable heads, are of a proper age and size for the purpose, and are preferable to older trees for any general plantation. They should be planted with all their heads entire, except retrenching any very irregular-placed branch, in the usual manner of tree-planting. See Planting.

In their future growth they should be suffered to branch naturally, so as to form large branchy heads, sufferring them all to remain entire. The general culture of this sort of trees, in respect to pruning, is very trifling, and only required occasionally, probably only once in several years; such as the retrenching any irregular growing branches, and thinning such branches are as very much crowded, cutting out all the decayed wood, and eradicating suckers from the roots and stumps. See Pruning.

When standard-trees are situated in a garden, in which the ground is necessarily dug over and trenched annually for the reception of the under-crop, and occasionally enriched with dung, they generally produce finer fruit than in orchards, or other places where the ground is not in similar culture.

Mr. Forsyth observes, that the method of pruning pear-trees is very different from that practised for apple-trees in general, in which the constant practice has been to leave great furs as big as a man's arm, standing out from the walls, from one foot to eighteen inches and upwards. The constant pruning invariably brings on the canker; and by the fur standing out so far from the wall, the blossoms and fruit are liable to be much injured by the fruit and blighting wind, and thus the sap will not have a free circulation all over the tree. The sap will always find its way first to the extremities of the shoots; and the furs will only receive it in a small proportion, as it returns from the ends of the branches; and the fruit standing at so great a distance from the wall is too much exposed to the weather, and, of course, is liable to be hard, spotted, and kerrinly.

The following method he has practised where the trees were all over cankered, and the fruit small, and not fit to be sent to the table. He cut the tops off as near as possible to where they were grafted, always observing to cut as close to a joint or bud as possible. The buds are hardly perceptible, but it can always be known where the joints, or forks, are, by the branches breaking out of the sides. He adds that finding the pear-trees in Kensington gardens in a very cankerly and unfruitful state in the years 1784 and 1785, he took out the old mould from the borders against the walls, and put in fresh loam in its stead; at the same time he pruned and nailed the trees in the common way, and left them in that state upwards of eighteen months, to see what effect the fresh mould would have on them; but to his great surprise he found that it had no effect. After this trial he began to consider if he should be content to recover their old trees. In this attempt he began with cutting down four old and decayed pear-trees of different kinds, near to the place where they had been grafted; this operation was performed on the 15th of May, 1786. Finding that they put forth fine shoots, he headed down four more on the 20th of June in the same year (for by this time the former had shoots of a foot long), which did equally well, and bore some fruit in the following year. One of the first four he headed down was a St. Germain, which produced nineteen fine large well-flavoured pears next year, and in the third bore more fruit than it did in its former state when it was four times the size. He left seven trees upon an east wall, treated according to the common method of pruning, which bore the following number of pears upon each tree. Epine d'hyver produced eighty-six pears, and the tree spread fifteen yards; a crafane produced one hundred pears, and the tree spread fourteen yards; another crafane produced thirteen pears, and the tree spread ten yards; a virgoule produced one hundred and fifty pears, and the tree spread nine yards; a colmar produced one hundred and fifty pears, and the tree spread nine yards; another colmar produced seventy-nine pears, and the tree spread ten yards; a l'echafferie produced sixty pears.

But seven trees headed down and pruned according to his own method, leaving the fore-right shoots in summer, bore as follows, in the fourth year after heading: a Louibonne bore four hundred and sixty-three pears, and the tree spread nine yards; another Louibonne bore three hundred and ninety-one pears, and spread eight yards; a colmar bore two hundred and thirteen pears, and spread six yards; a brown burre bore five hundred and three pears; another brown burre bore five hundred and fifty pears; a crafane bore five hundred and twenty pears; a virgoule bore five hundred and eighty pears. And he adds, that the branches of the four last trees spread nearly in the same proportion as the first three. He also states that a young burre, the second year after heading, bore two hundred and thirty pears; and a St. Germain four hundred. All the above trees stood in the same aspect and the same wall, and the fruit was numbered in the same year. A great many pears which dropped from the trees are not reckoned. The trees that were pruned according to the old practice covered at least one-third more wall than the other.

From this statement it appears that the trees headed down bore upwards of five times the quantity of fruit that the others did; and that it keeps increasing in proportion to the progress of the trees. This is an important statement in the culture and management of old trees of this sort; and the following fact with respect to standards is deserving of great attention: On the 20th of June he headed several standards that were almost destroyed by the canker; some of them were fo loaded with fruit the following year, that he was
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was obliged to prop the branches, to prevent their being broken down by the weight of it. In the fourth year after these standards were headed down, one of them bore two thousand eight hundred and forty pears. There were three standards on the same border with the above, two of which were St. Germain; the old tree was of the same kind. One of these trees, twenty years old, had five hundred pears on it, which was a great crop for its size: so that there were on the old tree, which had been headed down not quite four years, two thousand three hundred and forty pears more than on the tree of twenty years' growth. When the men numbered the pears, there was near a barrowful of wind-falls at the bottom of the old tree, which were not included. These and other statements are given in his useful treatise on the "Culture of Fruit-Trees."

The following is the method he pursues in training trees that are cut near to the place where they are grafted. In the month of March, every year, he shortens the leading shoot to a foot or eighteen inches, according to its strength: this shoot will, if the tree be strong, grow from five to seven feet long, in one seon; and, if left to nature, would run up without throwing out side-shoots. The reason for thus shortening the leading shoot is to make it throw out side-shoots, and if it be done clofe to a bud, it will frequently cover the cut in one seon, leaving only a cicatrix. When the shoots are very strong, he cuts the leading ones twice in one seon; by this method he gets two sets of side-shoots in one year, which enable him the sooner to cover the wall. The first cutting is performed any time during the spring, and the second about the middle of June. When you prune the trees, and cut the fore-right shoots, which should be done in February or March, always cut close to an eye or bud, oberving where you fee the greatest number of leaves at the lower bud, and cut at them; for at the footstalk of every one of these will be produced a flower-bud. The same will hold good in cutting the superfluous shoots on standard pears. He adds, that you will have in some sorts of pears, in a favourable seon, from five to nine pears in a chiot. This cutting should not be later than March, or the beginning of April, on account of the leading shoot beginning to grow: the next topping, when the leading shoot grows quick enough to admit of it, should be about the middle of June; and the length of the shoots should be according to their strength, having from three eyes or buds to fix on a side. It is added, that the cankerly part beginning to affect the new bark, he cut off all the canker at the bottom, and plastered the place with some cow-dung, mixed with wood-ashes and powder of burnt bones, put into as much urine and foapuds as would make it of the consistence of thick paint; this he laid on with a painter's brush. After it had been applied about three hours, he patted it gently down, with his hand, clofe to the tree. By so doing, he gets rid of all the air-bubbles that may be under the composition, and makes it adhere to the tree, preventing it from being washed off by heavy rains. And in the beginning of August he shortens the fore-right shoots to about four inches long; by this time the shoot will have made its full growth for the seon, and will produce fine strong eyes for the following year. Such shoots as grow near the flem of the tree, if any are wanted to fill up the wall, may be tucked-in as directed for peaches. This will prevent them from looking unftightly, and save them from the fury of the autumnal and winter winds. He further advises, that whenever the trunk is hollow, it be followed under ground till you have cut out all the decayed parts and rotten roots, otherwise you will lose the tree. By proceeding according to the foregoing directions, the roots will be renewed, while the tree is forming a fine handfome head. In the mean time the borders should be threnchd, taking up all the roots, and adding some fresh mould to them, if you can conveniently get it; if you cannot, remove all the four mould that is about the roots of the trees, and put in some taken from the border, at a distance from the wall; always remembering to lay the top spit next to the roots of the trees; also, to mix some vegetable mould, from the melon and cucumber beds, with rotten leaves, as a manure for the borders. He has headed down many trees that had not this preparation; and yet they thrive very well, but did not fend forth such fine roots and shoots as those that were so prepared. He concludes by obferving, that if the above directions be followed, more pears will be procured in three or four years than can be done in twenty-five years by planting young trees, and pruning and managing them in the common way. It is added, that if it should be found, that, before the pears arrive at half their natural size, they get fluted, after cold blighting winds, and frosty nights, he would recommend a new operation to be performed when the weather begins to grow mild, which is to take a sharp penknife, and with the point of it make an incision through the rind of the pear from the footstalk to the eye, in the fame way as in forcing a bark-bound tree, taking care to penetrate as little into the flesh of the pear as possible. At the fame time beat up some fresh cow-dung with wood-ashes, and with your fore-finger rub in a little of this composition where you made the incision; as the wound heals, the composition will be discharged from the fruit; this will prevent the pears from cracking and burling, which renders them good for nothing. The forts that are most liable to this disorder are, he obferves, the colmar, virgoule Rede, and cra- fane. He only, however, recommends this operation for wall pears, as it may be thought by some a troublesome operation, and it will certainly take up some time.

Signs of Ripeness in the Pears. — The maturity of the pear is generally known by its changing from a green to a yellow, or reddish colour, &c. and by the frequent falling from the tree; and when, with a gentle twirl or turn upwards, it easily quits its hold: but these signs of ripeness are more particularly observable in summer and autumn pears; as winter pears, not being maturely ripe when gathered, often require a good pull before they quit the branches.

The summer pears ripen in successiion in different sorts, from about the beginning or middle of July till the middle of September; many of the earlii ripening all at once, as it were, and continuing good but a few days, either on the tree or when gathered, nor will any of the sorts keep good long; and none of these sorts should hang on the tree till soft ripe, as in that case most of them would become mealy and inipid. These sorts should be gathered as soon as they are arrived to full growth, and just begin to colour and discover maturity, but before they become soft and mellow. For family use, they may be gathered from the tree according as they attain perfection; but the general crops of each sort should be always taken down before they ripen fully, and be laid in any dry room; none of the kinds will keep long, some only a few days, and scarcely any of them above a fortnight, though from different varieties ripening at different times, the sucession is continued for eight or ten weeks.

The autumn sorts ripen in different varieties, from about the middle of September till the end of October; some of the forwardest become edible on the tree, others requiring to lie some time after being gathered before they acquire perfection. The different sorts of these pears should be gathered according as they arrive to maturity; those defigued
to keep some time, may be gathered in dry weather, just when they have attained full growth, as shown by their frequent drooping, and by their readily quitting the trees on being handled, and laid in a dry close room, or in baskets, each lot separately.

The winter kinds attain their full growth on the trees about the end of October or beginning of November; but the eatable kinds do not acquire maturity for that purpose on the tree, or for some considerable time after they are gathered, some probably in a month, others two or three, and some more, and some lots not till the spring following. But the baking kinds may be used any time from October or November during their continuance. All winter pears should be indulged with as full growth on the tree as the weather will permit, even until the end of October, or first week in November; in the later kinds, if the season continues mild, be cautious, however, to get them gathered before attacked by much frost. And in gathering all the lots for keeping, dry weather should be chosen, and when the fruit is also quite dry, being careful not to bruise them. See Fruit.

Method of Forcing Pears.—These sorts of trees are sometimes forced by artificial heat, in some of the prime early kinds, to obtain a portion of fruit as early in the season as possible. This is effected by means of hot-walls and forcing-frames; having previously some trees of the choicest early summer pears, such as the jargonelle, or any other early lot, trained as wall-trees against a south wall, till advanced to some tolerable state of bearing; being then enclosed with glass frames, in the manner of forcing-frames or hot-walls, and having internally either flues for fire-heat, erected forward and extending long-ways, or otherwise a pit arranged in that direction, in the interval or space between the trees and the glass-work, for a bark or dung hot-bed; and by one or other of these methods a proper degree of artificial heat is produced internally to force an early growth in the trees, and forward them to early flowering and fruiting, managing them in the common way, as other trees in forcing-frames, so as to have some ripe fruit early in June, or some time in that month.

Method of Culture in the Apple Kind.—The whole of the varieties of the apple were first accidentally obtained by raising them from the kernels of the fruit; but as these cannot be dependent upon to continue the same sorts of fruit, grafting is the mode made use of to increase and continue the different varieties of them, which is performed upon crab, or any kind of apple stocks, raised from the kernels, for dwarfs as well as standards; and sometimes upon codlin and paradise apple stocks raised from cuttings and layers, when designed to have efpaliers and other dwarf trees, or for small standards, as low as possible, to be confined within a moderate space; some lots may also be raised by layers and cuttings, as the common codlin.

Stocks.—The method of raising the different sorts of stocks for the purpose is, in the crab and apple stocks, from the kernels of the fruit; but in the codlin and paradise stocks by cuttings and layers, to continue them with certainty of the same kinds and moderate growths. The crab and apple stocks may be raised from the kernels of any of the sorts, procuring them in autumn or winter, either from the fruit, or from such as have been pressed for vinegar and cider, clearing them from the grosser part of the pulp; then fowing them in beds of light earth, moderately thick, over the bed, or in drills, covering them about an inch deep. They come up in the spring; when, if the season prove dry, they should be watered occasionally, to forward and strengthen the growth of the plants; and in the autumn, winter, or spring following, the largest may be planted out in nursery-rows, shortening their tap-roots a little, and placing them in lines two feet and a half apart, to remain for grafting; after having from one to two or three years' growth, they will be fit for grafting upon, particularly for dwarfs, or even for full and half standards, if intended to form the item from the graft, which is an eligible method for these trees; but if the lot is to form the item, they require three or four years' growth, to rise to a proper height, four feet for full, and four or five for half standards. The modes of grafting all the forts is the same as for other fruit-trees, and should be performed in March, either by whip or cleft-grafting, according to the size of the stock. See Grafting.

Having provided proper grafts of the different sorts of apples intended to be raised, the stocks designed for dwarfs of all sorts must be grafted within six inches of the ground; and the standards may also be grafted low, one shoot from the graft being trained up for a item, or on tall stocks, at five or six feet in height, but for low and half standards, at from two or three, to four or five feet, and lower for dwarf standards. The grafts of all the forts should the same year; and, by the autumn following, the trees having formed little heads, of the same height, or as high, and about to ripen, they may then be planted out finally where they are to remain, or be retained a year or two, or longer, in the nursery, as may be requisite, training them for the purposes intended, as dwarfs, efpaliers, &c. &c., and uprights for standards, heading the dwarfs down in March following, within six inches of the graft, to force out more lateral shoots below to form a fuller head, proceeding immediately to turn them near the bottom, log as to fill the efpalier, &c. equally with branches, quite from within six or eight inches of the ground, regularly upward. In standards, these grafts low must be trained with one shoot upright, at full length, for a item, five or six feet high at least, for full standards before it is topped; though if grafted on tall stocks of height sufficient for a item, the shoots from the graft may either be headed to five or six eyes; or, if to form a more spreading head, remain entire, and aspire more in height, and assume a more upright growth: in all the modes of training, care should be taken to keep the items clear from all lateral shoots, displacing all such as soon as they appear, encouraging only a proper set of branches at top to form the head. When these trees have heads from one to two or three years old from the graft, they are of a proper age for planting out; though trees of four or five years old will also succeed very well, and even those of five or six years' growth may also be safely planted if required. The nursery-grounds are mostly furnished with all the varieties of these trees for sale, either quite young from the graft, or trained of several years' growth.

Choice of Trees.—In choosing the different kinds of trees for planting, care should be taken to have a collection of the principal varieties, both in efpaliers and standards, in proportion to the extent of the ground, as the trees of the best sorts are as easily raised and cultivated as the indifferent ones, allotting a smaller portion of the summer kinds, as such as ripen from August to about the middle of September, for immediate use off the trees, as they will not keep long; a larger supply of the autumn sorts, and most of all of the winter keeping apples: observing, in the summer kinds, that it is advisable to allot a principal supply of the common codlin in small standards, as being generally both a great bearer, and the fruit the most useful of the summer apples for culinary purposes, from its young green growth.
growth in June or July, till its full maturity in August and September, when it becomes also a good eating apple: and as the tree is a moderate grower, it admits of being planted in small standards closer or more abundant in a small extent of ground than most of the principal apple kinds.

In choosing apple-trees from the nursery, they should, Mr. Forsyth says, have strong, straight, and clean items. And he advises not to suffer the dwarf trees to run higher than twelve feet, as otherwise they become naked at bottom, the fruit is liable to be blown down, and the tops broken by high winds.

The proper season for planting all the sorts of apples is, in mild weather, from the end of October till March; but when planted in autumn, or early in winter, they establish themselves more firmly before the drought of the following summer. They succeed in any common soil and open situation, except in low very moist land, in which they are apt to canker, and soon go off: in a phialy, shallow loam they generally answer very well. The ground should be properly prepared, by good trenched, where the ranges of trees are to stand.

In the planting of espalier apple-trees they should be ranged at no less than eighteen or twenty feet distance; the latter especially for trees grafted on crab or apple flocks, which being free shoots, the branches readily fill that space. For the trees grafted on codlin and paradise flocks, fifteen or eighteen feet may be sufficient; though the latter, in particular, is sometimes planted only twelve or fifteen feet asunder, as being a very moderate shooter: it is, however, advisable to allow every forts full room, according to their growth, to have proper space to extend their branches always at full length. The trees should be planted with all their heads entire, only retrenching any very irregular growths, that do not range conveniently with the intended form, and pruning any broken roots. Then having opened a proper hole for each tree, plant them in the usual manner, being careful to place them with their branches ranging the way of the espalier. As soon as the earth of the holes and of the roots is properly settled, all the branches should be trained in horizontally to the right and left, an equal number on each side at full length, as above.

The general culture in espalier trees thus planted and trained, as the same branches or bearers continue fruitful many years, is to continue them as long as they remain of proper growth, constantly giving them a summer and winter pruning annually, as explained above. In wall-trees also, any of the principal choice varieties of eating apples may be trained, to forward and improve the growth, beauty, and flavour of the fruit; such as jennetings, Margaret apple, golden pippins, golden rennets, pearmain, &c. or any other approved eating kinds, a tree or two of a fort, against a south-west, or east wall.

Standard apples, when planted in the garden, should be arranged thinly, to admit of under crops growing freely, without being shaded by their spreading branches. Full standards should be chiefly planted for the general crops, and half and dwarf standards for variety. The standards, when trained as above, should be planted out with all their heads entire, when in the kitchen garden, at thirty feet distance in the rows; and for an orchard, thirty feet distance every way. In planting, for each tree a wide hole should be opened, trimming any long fragglings and broken roots, leaving all the others entire, and planting them with the usual care. As soon as planted out, every tree should be well flaked to support them firmly upright, and prevent their being disturbed in rooting by winds. See Orchard and Planting.

Smaller growing standards, such as codlins, or other low standards grafted upon codlin flocks, and dwarfs upon these or paradise flocks, may, if required, be planted only at fifteen or twenty feet distance in the rows, and not less than twenty-five feet between the lines of trees; though, if there be room to allow a greater distance both ways, it will be advantageous, especially in planting in kitchen gardens, in which it would be proper to allow double that distance between the rows of trees, of the larger growths of these kinds. The standards thus planted with their heads entire, should be suffered to advance with their branches at full length, and in general take their natural growth, when they soon form numerous natural spurs in every part for bearing.

In respect to pruning these standards, little is required, only the occasional retrenching any irregular cross-placed bough, or the reducing to order any very long rambler; or when the head is become greatly crowded and confused to thin out some of the most irregular growths, likewise all strong shoots growing upright in the middle of the head, and all dead wood, and suckers from the stem and root.

As to half and dwarf standards of these trees, they may be differed in different parts of the garden to cause variety, managing them as the full standards. The former on dwarf paradise flocks, being very moderate shooters, may be planted in a little compass, and are sometimes planted in pots for curiosity, to place on a table, amidst a defect, with the fruit growing on them. See Dwarf-Trees.

It is observed by Mr. Forsyth, that in heading down old decayed apple-trees, for the sake of symmetry, it will be necessary to cut at the forked branch as near as can be to the upper side of the fork, cutting them in a sloping manner to carry off the wet, at the same time rounding the edges. To begin at the lower branch, cutting still above the lower fork; and proceeding upwards, cutting the rest of the branches from one to fix joints, or forks, according to their strength, till you have finished cutting-in the whole head. If any of these branches should have the canker, all the infected part must be cut out. When the tree is all prepared, the composition should be immediately applied, beginning at the top of the tree, and finishing with the powder of wood-ashes and burnt bones as you descend, which will serve it from being rubbed off during the operation; and the composition will prevent the sun and air from injuring the naked inner bark. A tree thus prepared, will in the course of three or four years, produce more and finer fruit than a maiden tree that has been planted upwards of twenty years.

These directions, if properly attended to, will be sufficient, it is supposed, to enable any one to bring old decayed trees into a healthy bearing state.

It is believed, that in large orchards and gardens, it may be necessary, at first, to head down only every other tree; cutting some of the branches of the rest, which are in a decayed and cankerly state, and which bear no fruit. This will be preparing them to throw out new wood, and furnish the tree much sooner with bearing branches. He recommends the performing of the operation as early as possible; as by so doing the wood will be the stronger, as in May, or the two following months.

And it is added, that when the trees are become hollow, the same method should be followed as directed for plums; but by no means to cut them down unless the tops are quite decayed; observing to cut the loose rotten wood clean out of the hollow and other decayed parts, applying the composition; at the same time to open the ground, and cut out
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all the rotten parts that may be found in the lower part of the limb, together with all the decayed roots, which, if this be not done, will infallibly injure the fresh wood and bark, and prevent a cure from being effected. He would recommend heading down all apple-trees that are much cankered and have ill-shaped heads; as by so doing much labour will be saved, and the trees will amply pay the proprietor. He advises never to shorten the young branches, except they are very thin, when it will be necessary to do so to fill the trees with young wood: nor prune any of the young wood: nor prune any of the young shoots the second year (he means the year after they are cut), as many of the eyes, almost to the end of the shoot, will, if it be strong, become fruit-buds next year; and so on every year. It is contended, that in the month of May in the fifth year after the trees have been so cut, it will be necessary to go over them, and rub off with your finger and thumb all the superfluous young shoots; leaving from three to five eyes on each shoot, according to the size and strength of the branch cut. These shoots will bear from three to four years; by which time they will be pretty much exhausted by the great quantity of fruit produced from them: they should then be cut down to two eyes to produce new wood. He always leaves three different years' branches on the tree, when the first shoot is cut off. This is fully shown in a plate in his useful work; and the next shoot will be full of fruit-buds, if it has not been shortened: when it begins to grow weak, it should be cut off; and the next cutting must be made when the former branch is tired of bearing: by proceeding thus all over the tree with care and attention, the advantages of this method of pruning, above the common mode, will soon be perceived; as by it you will be able to keep the trees in a constant state of bearing, which, if left, to nature, would only produce a crop of fruit once in two or three years. When the shoot that is done bearing is cut off, the composition should constantly be applied, rubbing off the shoots where they are too numerous.

It is supponed, that the best time to prune apple-trees is in the month of April, or in May, after the operation has been performed on the peaches, nectarines, and cherries: and that soon after this pruning, about the middle of May, it will be proper to look over the trees, and to pick off any caterpillars that may be on them. It will then be seen what shoots are infected with the canker, and which might have escaped your notice at the time of pruning; and wherever you observe the least appearance of infection, which may be known by the wood appearing of a brownish colour, the shoot must be cut down till you come to the sound white wood. The small shoots that cross each other should be cut off, leaving the strongest to fill up the tree, and make a fine handsome head. The suckers that spring from the root should be carefully grubbed up, and the side-shoots from the stem cut off; for, if left to grow, they greatly weaken the tree. The knobs, where old branches have been cut off, should also be pared away, leaving the surface of the tree as smooth as possible; after which, the composition should be applied: the young bark will soon begin to grow, and by degrees cover the old wounds with a fresh smooth surface, and thus prevent the canker from gaining ground on the tree. He has seen some old wounds of considerable size, headed over in one year: and he adds, in confirmation of the utility of this practice, that the trees which he pruned and dressed, as above directed, in the course of the summer, 1795, are all perfectly cured, the wounds being filled up with sound wood, and covered over with new bark: they all continue in a healthy state, and bear fine handsome fruit. And he has advised several nurseriesmen to follow the practice, heading down their apple-trees after the season of drawing her bales is over. Mellers Gray and Wear have headed a great many of such trees as were formerly thrown into the figgote pile, and have been amply repaid for their trouble. Trees thus headed down, provided the limbs be strong, will, he thinks, in the third and second year, produce as much fruit as well refund the purchase-money; besides, a great deal of time will be saved, which would be lost by planting younger trees: as, where you can procure tree of the above description that have been headed down three or more years, they will be all covered with fruit buds: and, if carefully taken up and planted in the autumn, if the season proves favourable, they will have a tolerable crop of fruit the fifth year. Such trees must not be headed down like maiden trees, but only thinned off where the branches run across and rub against one another, which should never be suffered in these cases. He says, he would never recommend training apple-trees as espaliers; as by doing so the air is kept from the quarters of the garden; and by constant pruning and cutting off all the side-shoots which you cannot tie to the espaliers, you prevent them from bearing, and, moreover, bring on the canker. And when the dwarf trees have handsome heads, more and much finer fruit will be gotten from one of them than from the espaliers; at the same time, a free air is admitted to the crops in the quarters, and the constant expense of the flakes and labour, in laying the trees to the espaliers is saved. Espaliers may, he observes, be converted into dwarf standards by shortening the branches at different lengths, so as that they may be able to support themselves without the flakes: but not to shorten them all regularly; and if cut with judgment, as near to a leading shoot, or an eye, as possible, they will in the course of two years form fine heads, and in the third year bear six times the fruit as they did in their former state, and of a finer flavour. The same method of pruning as already laid down for standard apple-trees is also applicable to espaliers.

It is remarked, that the borders where you make your croffings in gardens should be six or eight feet broad at least, to let the trees spread on each side, at the distance of twelve feet from tree to tree, and they should be well trenched, two feet and a half deep at least. If there should be gravel, or four clay, it must be taken out, and good mould put in its place; leaving the ground as rough as possible for the frost and rain to melt it. When you level the ground it should be done after rain; you may then sow some small crops in the border; such as lettuce or spinach, or cabbage for transplanting; but let not any of the brassica tribe come to full growth. Leaving cabbage and broccoli on borders, near fruit-trees, draws the ground very much, fills the borders with insects, and also prevents the sun and air from penetrating into the ground. And when the sun can have free access to the border, it adds much to the flavour of the fruit. If you can spare the ground on the crofs-borders in winter, it will be of great service to the trees to rid it up as loose as you can, and let it lie in that state all winter, to mellow and sweeten.

Where the soil is strong, he would recommend planting of apple-trees that are grafted on paradise stocks; but if the soil be light, free stocks will do much better; and when the ground is light clay or brick-earth, it should be mixed with old lime-rubbish or coal-ashes, street-dung, or sand: but what he uses for the borders against the walls, and which he prefers to every other manner, is a vegetable mould produced from leaves of trees. Of this a good coat should be given once in two or three years, which will be sufficient, he thinks, for the borders where the wall-trees stand, and much better than dung, which he by no means approves.
approves of for trees, unless it be perfectly rotten and mixed up with mould.

In respect to grafting old apple-trees, he says, it frequently happens, that through some mistake or other, after waiting ten or twelve years for a tree to come into a bearing state, it is found that the fruit is neither fit for the table nor kitchen; in such cases they should always be grafted the following spring, observing to graft on the finest and healthiest shoots, and as near as possible to the old graft, and where the crofs-flouts break out; as by fo doing you will have some fruit the second year; and in the third, if properly managed, you will have as much as on a maiden tree of fifteen years standing; the canker, if any, must be carefully pared off the branch, and the icion must be taken from a sound healthy tree. Whenever an incision is made for budding or grafting, from that moment the canker begins. He would, therefore, recommend to those employed in budding or grafting, as soon as the incision is made, and the bud or graft inflected, to rub in with the finger, or a brush, some of the composition before the buds is tied on; then to cover the buds all over with the composition as thick as it can be laid on with a brush, working it well in. If this operation be performed in a proper manner, and in a moist scaven, it will answer every purpose without applying any grafting clay: as he has frequently done it, and found it succeed perfectly to his wishes. The matting which is wrapped round the bud should not be slackened too soon; for in that case you will find the incision opened, which very often occasions the death of the bud. If, says he, nurserymen and gardeners would give this method a fair trial, and use the same composition as he uses for curing defects in trees, instead of loam and horse-dung (which binds so hard as to prevent the rain and moisture from penetrating to the graft to moisten the wood and bark), they would find that the grafts would succeed much better. The composition, for this purpose, should be rather softer than grafting clay generally is; and instead of applying so large a mass as is generally done of clay, it need not, in moist cafes, be more than two or three inches in circumference, to effect the purpose.

Apples come to full growth in different forts successively, from July until the end of October: the summer kinds continue but a short time, but the autumn and winter apples keep from two or three to six or eight months and longer, in different varieties. The signs of perfection or full growth of the different sorts of apples, are by their affinming a lively colour, emitting a fragrant odour, frequently falling from the tree, and by quitting their hold easily on being handled.

Gathering.—In the gathering of all the sorts of apples for keeping, dry weather should always be chosent, and when the trees and fruit are also perfectly dry: observe likewise, in gathering apples for the table, and all kinds of apples designed for keeping any considerable time, that they be pulled one and one by hand. See Fruit.

The other species may be increased by grafting and budding them upon the common crab-stock: they should have sheltered situations, as they are rather tender while young. These trees afford ornament and variety in the clumps and shrubbery parts of pleasure-grounds.

Method of Culture in the Quince Kind.—These trees may be raised from the kernels of the fruit grown in autumn; but there is no depending on having the same sort of good fruit from seedlings, nor will they soon become bearers. But the several varieties may be continued the same by cuttings and layers; also by suckers from such trees as grow upon their own roots, and likewise be increased by grafting and budding upon their own pear-flouts, raised from the kernels in the same manner as for apples.

The raising by cuttings, layers, and suckers, is performed in autumn, winter, or spring, choosing young wood for the cuttings and layers, which should be planted and laid in the common method, when they will be rooted by the following summer, then planted out into nursery rows two feet asunder; plant the suckers also at the same distance, and then train the whole for the purposes intended: if for standards, run them up with a stem to any desired height, from three to five or six feet, then encourage them to branch out at top, to form a head; and those designed as dwarfs must be headed near the ground, and trained accordingly for espaliers, or dwarf standards, as directed under those articles: the grafting or budding is effected on quince or pear-flouts, and trained as above. When they have formed tolerable heads, they should be planted out finally.

Mr. Forfyth advises that the layers or cuttings should be planted in a shady place, in rows at about a foot distant from each other, and about three inches from plant to plant in the rows; mulching them with rotten leaves, or horse-dung, which will keep the ground about them moist; and watering them frequently in hot weather. About Michaelmas those that are well rooted may be planted out, and those that are not should remain another year. They may also be propagated by budding or grafting; and these trees will bear sooner, and be more fruitful than those raised by any other method.

He observes, that the quince-tree may be pruned much in the same way as an apple-tree, taking care to cut out all the old diseased and dead wood, and the crofs branches in the middle of the tree, which are apt to injure each other by friction. In general you will find old trees much hurt by injudicious pruning; in that case they should be headed down, cutting out all the cankery parts, and also all the diseased and dead wood where the tree is hollow, or where large branches have been cut or broken off, applying the composition as for apple-trees: and as quince-trees are very apt to have rough bark, and to be bark-bound, in these cases it will be necessary to have off the rough bark with a draw-knife, and to scarify them when bark-bound, brushing them over with the composition. It is also advised to plant quince-trees at a proper distance from apples and pears, as bees and the wind may mix the farina, and occasion the apples or pears to degenerate.

Standard quinces, designed as fruit-trees, may be shook in the garden or orchard, and some by the sides of any water, pond, watery-ditch, &c. as they delight in moisture, suffering the whole to take their own natural growth: and as espaliers, they may be arranged in assemblage with other moderate growing trees, such as apples and pears on paradise and quince-flouts, cherries, &c. being trained as directed for apples and pears in espaliers. They may also be planted in shrubberies, either as full or low standards, and permitted to take their own way of growth. See Orchard.

PYSTERA, in Ancient Geography, an island situated on the coast of Asia Minor, over-agamit Smyrna. Play. Pythagoras, in Biography. See Pythagoreans.

Pollution has been very liberal to this philosopher, in bestowing upon him all such inventions as others had neglected to claim, particularly in music; for there is scarcely any part of it, as a science, with which he has not been involved by his generous followers in biography.

Musical ratios have been assigned to him, with the method of determining the gravity or acoustic of sounds by the greater or less degree of velocity in the vibrations of strings;
the addition of an eighth to the lyre (Pliny, lib. ii. cap. 2); the harmony of the spheres (Plato); and the Greek musical notation (Boethius). His right, indeed, to some of these discoveries has been disputed by several authors, who have given them to others with as little reason, perhaps, as they had been before bestowed upon him.

But there is one discovery, relative to music, that has, at all times, been unanimously ascribed to him, which, however, appears to us extremely doubtful, not only whether it was made by him, but whether, in the manner it is related, it was ever made by any one.

We are told by Nicomachus, Gaudentius, Jamblichus, Macrobius, and all their commentators, "that Pythagoras, one day meditating on the sound of a man's rule, hit upon a string of such a pitch as would produce sound, in the proportion of 5 to 4. Upon this he fastened upon the nearest strings of equal length, and observed that the strings, which were four in number, formed a very harmonious sound, and found them to be in the proportion of 6, 8, 9, and 12. Upon this, he fastened upon the nearest strings, of equal length and thickness, &c. and found, that they gave the same sound. But he had not yet fixed upon the strings of equal lengths, and found that the hammer were not equal to the hammer used before, for the Greeks had not a greater hammer than the tetarch, or seven strings, till that time." Principles and Power of Harmony, p. 8.

This is the substance of the account, as it has been lately abridged by Mr. Stillingelet, who points out many incapable circumstances with respect to the story in general, and denies that the weights 6, 8, 9, 12, would give the intervals pretended; but seems not to have seen the difficulty in the fact, relative to different hammers producing different sounds upon the same string. The frontispiece to M. Mar- pargi's History of Music, represents the Samian lute in the act of weighing the hammers.

But though both hammers and anvil have been swallowed by ancients and moderns, and have passed through them from one to another, with an oltrich-like digestion, upon examination and experiment it appears, that hammers of different size and weight will produce different tones upon the same string, than bows or clappers of different sizes, will from the same string or bell.

Indeed, both the hammers and anvils of antiquity must have been of a construction very different from those of our degenerate days, if they produced any tones that were strictly musical. Of the millions of well-organized mortals, who have passed by blacksmiths' shops, since the time of Pythagoras, we believe no one was every detained by a single note, much less by an harmonious concord, from those Vulcanian instruments. A different kind of noise, indeed, will be produced by hammers of different weights and sizes; but it seems not to be in the power of the most subtle ear to discover the least imaginable difference with respect to gravity or acuteness. But though different noises may be produced from different bodies, in proportion to their size and solidity, and every room, chair, and table, in a house, has a particular tone, yet these noises can never be ascertained as melodic tones, which depend upon reiterated and regular vibrations of the aliquot parts of a string, or other elastic body; and in wind instruments, upon the undulations of the air conveyed into a tube. Noise may, indeed, be forced from a musical string, or instrument, by violence; but noise proceeding from bodies non-dissipative, or immusical, can never be fastened into sound. M. Roufliu (Dict. de Mus. art. Brilli) has ingeniously imagined that noise is of the same nature as sound, with this difference, that to produce sound, the one

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tone, with its consonant harmonics only, should be heard; such as the 8th, 12th, 15th, and 17th; whereas noise is produced by a jarring multitude of different tones, or even by one tone, when its vibrations are so violent as to render audible a considerable number of dissonant tones, of which the vibrations foment or never coincide; such as the 7th, 9th, 11th, &c.

The long belief of this story proves that philosophers themselves have sometimes taken facts upon truth, without verifying them by experiment. And as the tone of the hammers was affected without proof, so was the effect of their different weights fastened to strings; this Galileo discovered. The numbers 6, 8, 9, 12, applied to different lengths of strings, would, indeed, give the intervals mentioned. But it is proved, that to produce these intervals by the tension of different weights, the weights must be the squares of those numbers; that is, 36, 64, 81, 144. It is astonishing how the blunder had been echoed from author to author, without experiment, till the time of Galileo. And Bontempi, in trying the power of weights upon strings in the Pythagoric proportions of 6, 8, 9, 12, found, that instead of giving the 4th, 5th, and 8th of the grave tone, they produced only the minor 3d, major 3d, and tritonus; so that the whole account falls to the ground. But though modern incredulity and experiment have robbed Pythagoras of the glory of discovering musical ratios by accident, he has been allowed the superior merit of arriving at them by meditation and design. At least the invention of the harmonical canon, or monochord, has been ascribed to him both by ancient and modern writers. (See Monochord.) See Arif. Quint. p. 116. Prin. and Power of Harm. Hilt. des Mathem. par. Montucla. Euler, Tentamen nova Theor. Mus. and all the writers upon harmonics and temperament.

We shall enter no deeper into this subject here, than is absolutely necessary to explain the nature of the discovery attributed to Pythagoras, to which music is indebted for the honourable appellation of science.

Pythagoras supposed the air to be the vehicle of sound, and the agitation of that element occasioned by a similar agitation in the parts of the sounding body, to be the cause of it. The vibrations of a string, or any other sonorous body, being communicated to the air, affected the auditory nerves with the sensation of sound; and this sound, according to him, was acute or grave, in proportion as the vibrations were quick or slow. It was also known, by experiment, that of two strings equal in everything but length, the shorter made the quickest vibrations, and gave the acuter sound; in other words, that the number of vibrations made in the same time by two strings of different lengths, were inversely as those lengths; that is, the greater the length, the smaller the number of vibrations in any given time. By these discoveries it was that sound, considered in the vibrations that cause it, and the dimensions of the vibrating or sonorous body, was reduced to quantity, and as such, became subject to calculation, and explicable by numbers. Thus, for instance, the two sounds that form an octave are explicable by the numbers 1 and 2; which represent either the number of vibrations in a given time, or the length of the strings; and mean nothing more mysterious than that the acuter sound vibrates twice, while the graver vibrates once; or, that the string producing the lower sound is twice the length of that which gives the upper. If we consider the vibrations, the higher found is as 2, the lower as 1; or if you consider only the length. In the same manner, and in the same fende, the 5th is expressed by the ratio of 2 to 3, and the 4th by that of 3 to 4.
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Such was the ancient philosophy of sounds, of which Pythagoras is recorded as the first teacher. But how much of this theory was founded on experiment and demonstration, and how much of it upon hypothesis; how much of it was known, and how much taken for granted, cannot certainly be determined. The story just now discussed is too much embroiled with absurdities and impossibilities to guide us to any probable conjecture, as to the method by which Pythagoras actually arrived at his conclusions.

The discovery, as far as it relates to the length of strings, was easily made, because it depended upon an obvious experiment. It was, likewise, easily perceived, that a short string vibrated with more velocity than a long one; but between the certainty of this general fact, and the certainty that the vibrations were in a ratio exactly the inverse of the lengths, there is a considerable gulph. (See Smith’s Harmonics, sect. ii. art. 7, and note f.) We have no account of the bridge upon which Pythagoras got safely over. Experiment, here, is out of the question; for the lowest vibrations that produce musical sound, are far too quick to be counted or distinguished. The inference, however, was natural, though it does not appear that the ancients were able to support it by strict and scientific proof.

Indeed it was so late as the beginning of the present century, (1714. See Phil. Trans. and Methodus incrementorum directa et inversa, by Dr. Brook Taylor,) before this ancient theory of sound was fully confirmed, and the laws of vibrations, and the whole doctrine of musical strings, established upon the solid basis of mathematical demonstration.

The second musical improvement attributed to Pythagoras, was the addition of an eighth string to the lyre, which, before his time, had only seven, and was thence called a heptachord. It is supposed by several ancient writers, that the scale of this instrument, which was that of Terpander, consisted of two conjoint tetrachords, E F G A B b C D; and that Pythagoras, by adding an eighth found, at the top, and altering the tuning of the fifth, formed this scale: E F G A, B C D E, or a similar scale, confining of two disjunct tetrachords.

How this scale was generated by the triple progression, or feries of perfect 5ths, the abbé Rouffier has lately very well diffected, in his “Memoire sur la Musique des Anciens.” We shall endeavour to explain what is meant by the triple progression in music, which is the basis of this ingenious hypothesis; referring the reader to the Memoire itself for his proofs, as inferring them here would require too much time and space for a work of this nature.

Let any found be represented by unity, or the number 1; and as the 3d part of a string has been found to produce the 12th, or octave of the 5th above the whole string, a series of 5ths may be represented by a triple geometric progression of numbers, continually multiplied by 3, as 1, 3, 9, 27, 81, 243, 729; and these terms may be equally supposed to represent 12ths, or 5ths, either ascending or descending. For whether we divide by 3, or multiply by 3, the terms will be in the proportion of a 12th, or octave to the 5th, either way. The abbé Rouffier, imagining that the ancients sung their scale backwards, as we should call it, by descending, annexed to his numbers the sounds following:

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out of which series of 5ths, by arranging the sounds in diatonic order, may be formed the heptachord, or 7th, B C D E F G A; and to these, adding the duple of the highest found, in the proportion of 2 to 1, the abbé supposes that Pythagoras acquired the octave, or profunamemnos. This is throwing a mite into the charity-box of poor Pythagoras, without, however, telling us in what reign the obolus was coined; for we have met with no ancient author who betoys the invention of profunamemnos upon this philosopher. The abbé does not let him or his followers step here, but supposes an 8th term, 2187, added to the progression given above, by which a B b was obtained, which furnished the minor femitones below B b. The system of Pythagoras, according to the abbé, was bounded by this 8th term, and the principle upon which it was built being lost, the Greeks penetrated no farther into the region of modulation, where they might have enriched their music, but contented themselves, in after-times, with transpositions of this series of found.

The abbé Rouffier imagines, however, that though Pythagoras went no farther than the eighth term in triple progression, yet the Egyptians, in very high antiquity, extended the series to twelve terms, which would give every possible mode and genus perfect. A curious circumstance is observed by the same author, p. 28, § 47, with respect to the musical system of the Chinefe, which well deserves mention here.

"In collecting," says he, "what has already been advanced concerning the original formation of the Chinese system, it appears to begin precisely where the Greek left off, that is, at the VIIIth term of the triple progression, which is purfed as far as the XIIth term, by which feries, arranged dia- tonally, the Chinese acquire their scale, e b, D b, B b, A b, G b, E b, in defcending: or, as Rameau exprefles the fame intervals, in flarps, defcending, G #, A #, C #, D #, E #, G #."—It is observable that both these scales, which are wholly without fermities, are Scotifh, and correspond with the natural scale of the old fimple enharmonic, given p. 34. M. Jamard, a late French writer on music, pulling calculation till further than either the Egyptians or Chinese, has obtained, by purfuing the harmonic feries, 1, 2, 3, 4, &c. &c. not only the enharmonic diesis, but even the minute intervals in the warbling of birds; it is wonderful he did not apply his ratios to human speech.

After musical ratios were discovered and reduced to numbers, they were made by Pythagoras and his followers, the type of order and just proportion in all things: hence virtue, friendship, good government, celestial motion, the human soul, and God himself, were harmony.

This discovery gave birth to various species of music, far more strange and inconceivable than chromatic and enharmonic, such as divine music, mundane music, elementary music, and many other divisions and subdivisions, upon which Zarlino, Kircher, and almost all the old writers, never fail to expatiate with wonderful complacency. It is, perhaps, equally to the credit and advantage of music and philosophy, that they have long descended from these heights, and taken their proper and separate stations upon earth: that we no longer admit of music that cannot be heard, or of philosophy that cannot be understood.

Arifides Quintianus affirms us, that music comprehends arithmetic, geometry, physics, and metaphysics, and teaches every thing, from founding the scale, to the nature and construction of the soul of man and the soul of the universe. To confirm this, he quotes, as a divine saying, a most curious account of the end and beginning of music, from one master Panacmus, which informs us that the province of music is not only to arrange musical sounds, and to regulate the voice, but to unite and harmonize every thing in nature. This writer, p. 102, in solving the question, whence it is that the soul is so easily affected by instrumental music, acquaints us, in the Pythagorean way, how the soul, frisking about, and playing
playing all kinds of tricks in the purer regions of space, approaches by degrees to our gross atmosphere; gets a taint for matter and fondness, and at length acquires a warm and comfortable body to cover her nakedness. Here the picks, up nerves and arteries; there membranes, here spirit or breath; and all in a most extraordinary manner; especially the arteries and nerves; for what should they be made of, but the circles and lines of the spheruses, in which the soul gets entangled in her paffage, like a fly in a spider’s web. Thus, continues he, the body becomes similar in its texture to instruments of the wind and stringed kind. The nerves and arteries are stringing, and at the same time they are pipes filled with wind. “What wonder, then,” says Arilides Quintilanius, “if the soul, being thus intimately connected with a body similar in construction to those instruments, should sympathize with their motions.”

Maiter Thomas Mace, author of a most delectable book, called *Musick’s Monument,* would have been an excellent Pythagorean; for he maintains that the mystery of the *Tri
ty is periphrastically made plain by the connection of the three harmonical concords, 1, 3, 5; that music and divinity are nearly allied; and that the contemplation of concord and discord, of the nature of the octave and unison, will so strengthen a man’s faith, that he shall never after degenerate into that *grof sub-bodified sin of atheism.*” P. 268.

Pythagoras is said, by the writers of his life, to have regarded music as something celestial and divine, and to have had such an opinion of its power over the human affections, that, according to the Egyptian system, he ordered his disciples to be waked every morning, and lulled to sleep every night, by sweet sounds. He likewise considered it as greatly conducive to health, and made use of it in disorders of the body, as well as in those of the mind. His biographers and secretaries even pretend to tell us what kind of music he applied upon these occasions. Grave and solemn, we may be certain; and vocal, say they, was preferred to instrumental, and the lyre to the flute, not only for its decency and gravity, but because instruction could be conveyed to the mind, by means of articulation in singing, at the same time as the ear was delighted by sweet sounds. This was said to have been the opinion of Minerva. In very high antiquity mankind gave human wisdom to their gods, and afterwards took it from them, to bestow it on mortals.

In perusing the life of illustrious men, who have sprung from the school of Pythagoras, it appears that the love and cultivation of music was so much a part of their discipline, that almost every one of them left a treatise behind him upon the subject.

**Pythagoras’s Table. See Table.**

**PYTHAGOREA, in Botany, received that appellation from Loureiro, in memory of the famous Pythagoras, who is said to have written a book on the qualities of plants.—Loureiro. Cochinh. 245. Clufs and order, Odontria Tetra
gynia. Nat. Ord. . . . . . . . . . .

Gen. Ch. Calc. Perianthus inferior, bell-shaped, of seven or eight linear, hairy, coloured leaves. Cor. superior, bell-shaped, of seven or eight lanceolate, concave, hairy petals, the length of the calyx. Stam. Filaments eight, awl-shaped, longer than the corolla; anthers roundish, two-lobed. Pet. German between the calyx and corolla, nearly ovate, hairy; styles four, awl-shaped, reflexed, flatter than the filaments; illiciacegs acute. Peric. Capsule ovate, of four cells. Seeds numerous, roundish.

Eff. Ch. Calyx of seven or eight leaves, inferior. Corolla of seven or eight petals, superior. Capsule of four cells, with many seeds.

1. P. Cochinchinensis. — Native of Cochinchina, where it is called *Xuông cát châm bò.* A small tree, with numerous branches. Leaves nearly sessile, ovato-lanceolate, serrated, serrulate; their longitudinal ribs red at the extremity. Chyffe
ters axillary, long, nearly simple, with short partial flacks. Flowers white.

Such is Loureiro’s account, but we have no knowledge of the plant he describes, nor can we offer any conjecture respecting its natural affinity. We have no faith in the existence of a genus inferior to the calyx and inferior to the corolla, the only influence of the kind which Linnaeus ever imagined, in *Sanguinaria,* proving not well founded.

**PYTHAGOREAN, or Pythagoric System, among the Ancients, was the same with the Copernican system among the moderns. See System.**

It was thus called, as having been maintained and cultivated by Pythagoras, and his followers; not that it was invented by him, for it was much older.

**PYTHAGOREANS, a sect of ancient philosophers, who adhered to the doctrine of Pythagoras.**

Pythagoras, the founder of this sect, was of Samos, the son of a lapidary, and a pupil of Phericydes, and flourished (fays Bayle) about five hundred years before Christ, in the time of Tarquin, the last king of Rome, and not in Numa’s time, as many authors have supposed. See Cicero Tufecul. Queri. lib. iv. cap. 1.

The time of his birth, however, has been much disputed. Dr. Bentley, in his *Dissertation on the Epitites of Phalaris,* relying chiefly on the authority of Eratosthenes, refers the birth of Pythagoras to the 41st year of the 436 Olympiad, B.C. 586. Lloyd, in his *Dissertation concerning the Chronology of Pythagoras,* ascribes his birth to the 39th year of the 488 Olympiad, B.C. 586. Dodwell places it in the 4th year of the 52d Olympiad, B.C. 569, relying in this date chiefly on the authority of Porphyry and Jamblichus. Upon the whole, the opinion of Lloyd seems to be the most probable, which is, that he was born about the year B.C. 586, and that he died about the 39th year of the 68th Olympiad, B.C. 569; so that it seems pretty certain, that he was not born earlier than the 49th year of the 436 Olympiad, B.C. 605, nor later than the 49th year of the 52d, B.C. 569. If we admit only the credible particulars of his childhood and early education, and pay no attention to the tales of Jamblichus and others, who even alleged that he was the son of God, we shall find that he was first instructed in his own country by Cresphilus, and afterwards by Pherecydes, in the island of Scyllus, and that after having paid his last tribute of respect to his preceptor, he returned to Samos, and pursued his studies under the direction of his first master. Jamblichus, and other later biographers, mention his journey into Ionia, and his interviews with Thales and Anaximander, but of this journey we have no authentic record, nor is any effect of it discernible in his doctrine, which is essentially different from that of the Ionic school. His first journey from the Greek islands was probably into Egypt, which was celebrated in his time for that kind of wildness which bell lent his genius and temper. In his way thither, Jamblichus asserts that he visited Phenicia, and conversed with the prophets and philosophers that were the successors of Mochus the Phylologus; which Mochus, Sado, and some others, will have to be Mosis.

Nor is it thought at all improbable that Pythagoras might, with a ready assent to the Iraochian philosophy, of which he must, without doubt, have received a general report from his father, and from other merchants who traded to this coast. But that he derived his knowledge of numbers from the Phenicians is not at all probable, because their acquaintance with numbers extended no further than
to the practical science of arithmetic. It has been said, indeed, that Pythagoras travelled, not only into Egypt and Chaldea, but even into the Indies, to inform his understanding with regard to all branches of science and prevalent customs; and that after returning to his own country, being unable to bear the tyranny of Polycrates, he retired into the eastern part of Italy, then called Magna Gracia, and established his sect, denominated from this circumstance the “Italic Sect,” or “Italic School.” Whatever opinion is entertained of this journey to the East, to which Le Clerc gives no credit, we must altogether reject other stories of his visiting the temple on mount Carmel, and remaining there for several days, without food, passing among the inhabitants for a good demon, and obtaining from them religious honours; and of his proceeding into India, and there passing through several ceremonies of the Moabic law.

Pythagoras, whilst he was in Egypt, was introduced by the recommendation of Polycrates, tyrant of Samos, to Amasis, king of Egypt, a distinguished patron of literary men, and thus obtained access to the colleges of the priests. Having found it difficult to gain this privilege, he performed many severer and troublesome preliminary ceremonies, and even submitted to circumcision, a preferred condition of his admission. He passed twenty-two years in Egypt, availing himself of all possible means of information with regard to the recondite doctrines of the Egyptian priests, as well as to their astronomy and geometry, and Egyptian learning in its most unlimited extent.

Many writers of reputation, both Pagan and Christian, who flourished after the commencement of the Christian era, relate, that after Pythagoras had left Egypt, he visited the Persian and Chaldaean Magi, and proceeded so far as to have intercourse with the Indian Gymnosophists. Jamblicus affirms, that he was taken captive by the Persian arms of Cambyses, and carried to Babylon, where he acquainted himself with the learning and philosophy of the East; and that after the expiration of twelve years, when he was in the 60th year of his age, he returned to Samos. The circumstance of his having visited the Persian magi is also mentioned by Cicero, Eusebius, Laertius, and Valerius Maximus, though they take no notice of his captivity. In this journey to the East, as some have maintained, he attended upon the instructions of the celebrated Persian sage, Zoroaster; and others, who have placed the life of Zoroaster in an earlier period than that of Pythagoras, have asserted, that he converted with certain Jewish prophets, who were at that time in Babylon, in a state of captivity, and thus became acquainted with the Jewish laws and customs. However, several objections, particularly of a chronological kind, have been alleged against the narrative of Pythagoras’s journey to the East. Chronologists unanimously agree, that Cambyses invaded Egypt in the fifth year of his reign, or the third year of the 63d Olympiad. According to Jamblicus, Pythagoras, after staying twelve years in Babylon, and visiting several other countries, went into Italy in the 62d Olympiad. The same date is affixed to this journey by Diidorus and Clemens Alexander; whilst others place it about fourteen years earlier. Hence it appears, that if Pythagoras left the East before the 62d Olympiad, after remaining there twelve years, he could not have been carried thither by Cambyses in the 63d Olympiad. Moreover, the whole narration of Pythagoras’s journey into the East is contradicted by the express authority of Antiphorus (quoted by Porphyry), who says that Pythagoras, after his residence in Egypt, returned into Ionia, and opened a school in his own country; and that, at the age of forty years, finding himself harassed by the tyranny of Polycrates, he withdrew into Italy; and according to this account, we have no interval for the supposed eastern expedition. The reality of this expedition is testified either by certain Alexandrian Platonists, who were defirous of exalting, as much as possible, the wisdom of those ancient philosophers, whom they considered as the oracles of wisdom, or by certain Jewish and Christian writers, who were disposed to credit every tale which tended to give probability to the opinion that the Pythagorean doctrine was derived from the Oriental philosophers, and ultimately from the Hebrew scriptures.

In either case the authenticity of the relation is liable to just suspicion; nor is there any probable argument to prove, that Pythagoras received instruction from any prophet of the Hebrew nation, during his supposed residence at Babylon. Drucker concurs with those writers who are disposed to reject this story of Pythagoras’s eastern journey as a mere fiction, and who concludes that, having never passed from Egypt to the East, he returned thence immediately to Samos. The story of his having visited the northern Druids is so delusive of probability and of evidence, as to merit no regard.

After his return from Egypt to his native island, he wished to communicate the benefit of his twenty years’ researches and studies to his fellow-citizens, and with this view he attempted to institute a school for their instruction in the elements of science; proposing to adopt the Egyptian mode of teaching, and to communicate his doctrines under a symbolical form; but the Samians were either too stupid or too indolent to profit by his instructions. Although he was obliged to relinquish his design, he did not altogether abandon it. In order to engage the attention of his countrymen by some other means, he repaired to Delos; and after presenting an offering of cakes to Apollo, he there received, or pretended to receive, moral dogmas from the priests, which he afterwards delivered to his disciples under the character of divine precepts. With the same views he also visited the island of Crete, so celebrated in mythological history; where he was conducted by the Corybantes, or priesets of Cybele, into the cave of mount Ida, in which Jupiter is said to have been buried. Here he conversed with Epimenides, an eminent pretender to prophetic powers, and was by him initiated into the most sacred mysteries of Greece. About the same time he visited Sparta and Elis, and was present during the celebration of the Olympic games, where he is said to have exhibited a golden thigh to Abaris, in order to convince him that he was Apollo. Besides other places which he visited during his stay in Greece, he repaired to Phlius, where he first assumed the appellation of philosopher. (See Philosopher.) Having thus added to the stores of learning which he had previously accumulated, and acquired a kind of authority which was calculated to command respect, he returned to Samos, and made a second attempt, more successful than his first, for establishing a school of philosophy. In a semicircular kind of building, which the Samians had used as a place of resort for public buffoons, he delivered with an assumed authority of a sacred nature, popular precepts of morality: and he also provided for himself a secret cave, into which he retired with his intimate friends and professed disciples, and here he gave his followers daily instructions, accompanied with a considerable parade of mystery, in the more abstruse parts of philosophy. His fame, and the multitude of his followers, increased. What he failed to accomplish by the mere force of learning and ability, he effected by concealing his doctrines under the veil of mysterious symbols, and infusing forth his precepts as reprobates from a divine oracle. About the beginning of the 59th Olympiad, Pythagoras, defirous of escaping the
the tyrannical government exercised in his native island by Sylfon, the brother of Polycrates, left Samos, and, as we have already hinted, passed over into Italy, and attempted to establish his school among the colonies of Magna Græcia. It is probable that, in order to obtain credit with the populace, he about this time pretended to possess a power of performing miracles, and practised many arts of imposture. The first place at which he arrived in Italy was Crotona, a city in the bay of Tarentum, the inhabitants of which were very corrupt in their manners. But such were his reputation and influence, that he was treated with great respect, and people of all classes assembled to hear his discourses; insomuch that the manners of the citizens were soon totally changed from great luxury and licentiousness to strict sobriety and frugality. It is said that 600 (some say 2000) persons were prevailed upon to submit to the strict discipline which he required, and to throw their effects into a common stock for the benefit of the whole fraternity. The influence of his philosophy extended from Crotona to many other cities of Magna Græcia, and obtained for Pythagoras from his followers a degree of respect little short of adoration. If he had contented himself with delivering doctrines of philosophy and precepts of practical wisdom, he might probably have continued his labours, without molestation, to the end of his life. But he manifested a strong propensity towards political innovations; and he employed his influence in urging the people to the strenuous assertion of their rights, against the encroachments of their tyrannical governors. This course of conduct raised against him a very powerful opposition, which he was unable to repel and contend against, and which obliged him to retire to Metapontum. Here he found himself still surrounded with enemies, and was under a necessity of seeking an asylum in the temple of the Muses, where, not being supplied by his friends with sufficient food, he perished from hunger. The time of his death is uncertain; but according to the Chronicon of Eusebius, he died in the third year of the 68th Olympiad, B.C. 506, after having lived, according to the most probable statement of his birth, to the age of 80 years. After his death his followers paid a superstitious respect to his memory. They erected statues in honour of him, converted his house at Crotona into a temple of Ceres, the street in which it stood was called the Muses, and appealed to him as a divinity, swearing by his name.

It appears, from the history of this philosopher, that with all his talents and learning, he owed much of his celebrity and authority to imposture. His whole manner of life confirms this opinion. Clothed in a long white robe, with a flowing beard, and, as some say, with a golden crown on his head, he preferred among the people, and in the presence of his disciples, a commanding gravity and majesty of aspect. He recurred to music for promoting the tranquillity of his mind, frequently finging, for this purpose, hymns of Thales, Hesiod, and Homer. He had such an entire command over himself, that he was never seen to express, in his countenance, grief, joy, or anger. He refrained from animal food, and confined himself to a frugal vegetable diet, excluding from his simple bill of fare, for mythical reasons, pulse or beans. By this artificial demeanour, Pythagoras appeared among the vulgar as a being of an order superior to the common condition of humanity, and persuaded them that he had received his doctrine from heaven. Pythagoras married Theano of Crotona, or, as some say, of Crete, by whom he had two sons, Telesuges and Mnefarchus, who, after his death, took the charge of his school. Whether this philosopher left behind him any writings has been a subject of dispute. Many works have been enumerated under his name by Laerlius, Jamblichus, and Pliny; but it is the declared opinion of Plutarch, Jophusus, Lucian, and others, that there were no genuine works of Pythagoras extant; and it appears highly probable, from the pains which he took to confine his doctrine to his own school during his life, that he never committed his philosophical system to writing, and that the pieces to which his name was affixed at an early period, were written by some of his followers, upon the principles imbibed in his school. The famous golden verses attributed to Pythagoras, and illustrated with a commentary by Hierocles, were not written by our philosopher, but are to be ascribed to Epicharmus, or Empedocles. They may, however, be considered as a brief summary of his popular doctrines.

His "Method of instruction," formed upon the Egyptian model, was "exoteric," and "esoteric," that is, public and private. Those auditors, who attended his public lectures, did not properly belong to his school; but followed their usual mode of living. His select disciples, called his companions and friends, were such as submitted to a peculiar plan of discipline, and were admitted, by a long course of instruction, into all the mysteries of his esoteric doctrine.

Previously to the admission of any person into this fraternity, Pythagoras examined his features and external appearance; inquired how he had been accustomed to behave towards his parents and friends; marked his manner of laughing, conversing, and keeping silence; and observed what passions he was most inclined to indulge; with what kind of company he chose to associate; how he passed his leisure moments; and what incidents appeared to excite in him the strongest emotions of joy or sorrow. Nor after this examination was any one admitted into his society, till he was fully persuaded of the docility of his dispositions, the gentleness of his manners, his power of retaining in silence what he was taught, and, in fine, his capacity of becoming a true philosopher. After the first probationary admission, the candidate was put to the trial by a long course of severe abstinence and rigorous exercises. The course of abstinence and self-denial comprehended food and drink, and clothing, all which were of the most plain and simple kinds; and the exercises prescribed were such as could not be performed without pain and fatigue. To teach them humility and industry, he exposed them, for three years, to a continued course of contradiction, ridicule, and contempt, among their fellows. In order to replenish the powerful passion of avarice, he required his disciples to submit to voluntary poverty; he deprived them of all command over their own property, by calling the possessions of each individual into a common stock, to be distributed by proper officers, as occasion required. After this sequestration of their goods, they lived together on the footing of perfect equality, and sat down together daily at a common table. If any one afterwards repeated of the connection, he was at liberty to depart, and might reclaim, from the general fund, his whole contribution. That his disciples might acquire a habit of entire docility, Pythagoras enjoined upon them, from their first admission, a long term of silence, called εὐχαρίστησις. This initiatory silence, which probably consisted in refraining from speech, not only during the hours of instruction, but through the whole term of initiation, continued from two to five years, according to the propensity discovered by the pupil towards conceit and loquacity. With regard to himself, this was a judicious expedient, as it checked impertinent curiosity, and prevented every inconvenience of contradiction. Accordingly his disciples silenced all doubts and refuted all objections,
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jections, by appealing to his authority. *Ades εκατ. ἴπο γίγνεται, decided every dispute. Moreover, during the years of initiation, the disciples were prohibited from feering their master, or hearing his lectures, except from behind a curtain, or receiving instruction from some inferior preceptor.

To the members of the esoteric school (who were called *meta* *μεταπολεμείς* genuine disciples) belonged the peculiar privilege of receiving a full explanation of the whole doctrine of Pythagoras, which was delivered to others in brief precepts and dogmas, under the concealment of symbols. Disciples of this class were permitted to take minutes of their master's lectures, in writing, as well as to propose questions, and offer remarks, upon every subject of discourse. These were particularly distinguished by the appellation of the "Pythagoreans;" they were also called "Mathematicians," from the studies upon which they entered immediately after their initiation. Having made a sufficient progress in geometrical science, they proceeded to the study of nature, the investigation of primary principles, and the knowledge of God. Those who pursued these sublime speculations were called "Théorists," and those who devoted themselves more particularly to theology, were styled *περιπλούντες* religious. Others, according to their abilities and inclinations, were engaged in the study of morals, economics, and policy; and were afterwards employed in managing the affairs of the fraternity, or sent into the cities of Greece, to instruct them in the principles of government, or affitt them in the institution of laws.

The brethren of the Pythagorean college at Crotona, called *πρὶς ἔργον*, *κοινῆς* about 650 in number, lived together as in one family, with their wives and children; and the whole busines of the society was conducted with the most perfect regularity. Every day commenced with deliberation upon the manner in which it should be spent; and concluded with a retrospect of the events that had occurred, and of the business that had been transacted. They rose before the sun, that they might pay him homage; after which they repeated select verses from Homer and other poets, and made use of music, both vocal and instrumental, to enliven their spirits and fit them for the business of the day. They then employed several hours in the study of science. These were succeeded by an interval of leisure, which was commonly spent in a solitary walk for the purpose of contemplation. The next portion of the day was allotted to conversation. The hour immediately before dinner was filled up with various kinds of athletic exercises. Their dinner consisted chiefly of bread, honey, and water; for after they were perfectly initiated, they wholly denied themselves the use of wine. The remainder of the day was devoted to civil and domestic affairs, conversation, bathing, and religious ceremonies.

The "exoteric" disciples of Pythagoras were taught, after the Egyptian manner, by images and symbols, obscure and almost unintelligible to those who were not initiated into the mysteries of the school; and those who were admitted to this privilege were under the strictest obligation of silence with regard to the recondite doctrines of their master. The wisdom of Pythagoras, that it might not pass into the ears of the vulgar, was committed chiefly to memory; and when they found it necessary to make use of writing, they took care not to suffer their minutes to pass beyond the limits of the school.

Clemens observes, that the two orders above described corresponded very exactly to those among the Hebrews; for in the schools of the prophets there were two classes, *viz.* the sons of the prophets, who were the scholars; and the doctors or masters, who were also called *perfecti*; and among the Levites, the novice or tyros, who had their quinquennial exercises, by way of preparation. Lastly, even among the profelytes there were two orders; *exoteric*, or profelytes of the gate; and *interior* or *perfecti*, profelytes of the covenant. He adds, it is highly probable, that Pythagoras himself had been a profelyte of the gate, if not of the covenant.

Gale endeavours to prove, that Pythagoras borrowed his philosophy from that of the Jews; to this end producing the authorities of many of the fathers, and ancient authors; and even pointing out the tracks and footsteps of Moises in several parts of Pythagoras's doctrine.

After the dissolution of the assembly of Pythagoras's disciples by the fact of Cylo, a man of wealth and distinction at Crotona, it was thought necessary by Lyfis and Archippus, in order to preserve the Pythagorean doctrine from oblivion, to reduce it to a systematic summary; at the same time, however, strongly enjoining their children to preserve these memoirs secret, and to transmit them in confidence to their posterity. From this time books began to multiply among the followers of Pythagoras, till at length, in the time of Plato, Philolaus exposed the Pythagorean records to sale, and Archytas of Tarentum gave Plato a copy of his commentaries upon the aphorisms and precepts of his master. Of the imperfect records of the Pythagorean philosophy left by Lyfis, Archytas, and others, nothing has escaped the wreck of time, except perhaps fundry fragments collected by the diligence of Stobæus, concerning the authenticity of which there are some grounds for suspicion; and which, if admitted as genuine, will only exhibit an imperfect view of the moral and political doctrine of Pythagoras under the disguise of syllogistical and enigmatical language. The strict injunction of secrecy, which was given by oath to the initiated Pythagoreans, has effectively prevented any original records of their doctrine concerning Nature and God from passing down to posterity. On this head we are to rely entirely for information, and indeed concerning the whole doctrine of Pythagoras, upon Plato and his followers. Plato himself, while he enriched his lyceum with flowers from the magazine of Pythagoras, accommodated the Pythagorean doctrines, as he also did those of his master Socrates, to his own lyceum, and thus gave an imperfect, and, we may say, in many particulars, a false representation of the doctrines of the Samian philosopher. It was further corrupted by the followers of Plato, even in the old academy, and afterwards in the Alexandrian school. To which we may add, that the doctrine of Pythagoras itself, probably in its original state, and certainly in every form under which it has been transmitted to us, was observed, not only by syllogeial, but by mathematical language, which is rather adapted to perplex than to illustrate metaphysical conceptions. In this fault Pythagoras was afterwards imitated by Plato, even in the old academy, and afterwards in the Alexandrian school. 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contemplation. The whole course of mathematical science may be divided into four parts: two respecting numbers, and two respecting magnitude. Number may be considered either abstractedly in itself, or as applied to some object. The former science is arithmetic; of the latter kind is music.

Magnitude may be considered as at rest, or as in motion; the science which treats of the former is geometry, that which treats of the latter is astronomy.

Arithmetic is the noblest science; numbers the first object of study, and a perfect acquaintance with numbers the highest good. Numbers are either scientific or intelligible.

Scientific number is the production of the powers involved in unity, or the progression of multitude from the monad or unity, and its return to the same. Unity and one are to be distinguished from each other; the former being an abstract conception, the latter belonging to things capable of being numbered. Number is not infinite, but is the source of that infinite divisibility into equal parts, which is the property of all bodies.

Intelligible numbers are those which subsist in the divine mind before all things, from which every thing hath received its form, and which always remain immutably the same. It is the model, or archetype, after which the world, in all its parts, is framed. Numbers are the cause of all things of heavens: τὸ διδομένος ἀληθῶς τοῖς ἀληθείαις.

The monad, or unity, is that quantity, which, being deprived of all number, remains fixed; whence called monad, from τὸ μοῖρον. It is the fountain of all number. The duad is imperfect and passive, and the cause of increase and division. The triad, composed of the monad and duad, partakes of the nature of both. The tetrad, composed of the monad, duad, and triad, is the most perfect. The decade, which is the sum of the four former, comprehends all numerical and musical proportions.

According to some writers, the monad denotes the active principle in nature, or God; the duad, the passive principle, or matter; the triad, the world formed by the union of the two former; and the tetrad, the perfection of nature. Some have understood by this mysterious number, the four elements; others, the four faculties of the human mind; others, the four cardinal virtues; and others have been so absurd as to suppose that Pythagoras made use of this number to express the name of God, in reference to the word γαύδια, by which that name is expressed in the Hebrew language. But every attempt to unfold this mystery has hitherto been unsuccessful.

The most probable explanation of the Pythagorean doctrine of numbers is, that they were used as syllogistical or emblematical representations of the first principles and forms of nature, and particularly of those eternal and immutable essences, to which Plato afterwards gave the appellation of ideas.

Not being able, or not knowing, to explain in simple language the abstract notions of principles and forms, Pythagoras seems to have made use of numbers, as geometers make use of diagrams, to affist the conceptions of scholars. More particularly, conceiving some analogy between numbers and the intelligent forms which subsist in the divine mind, he made the former a symbol of the latter.

As numbers proceed from unity, or the monad, as a simple root, whence they branch out into various combinations, and assume new properties in their progress, so he conceived the different forms of nature to recede, at different distances, from their common source, the pure and simple essence of deity, and at every degree of distance to assume certain properties in some measure analogous to those of number; and hence he concluded, that the origin of things, their emanation from the first being, and their subsequent progression through various orders, if not capable of a perfectly clear explanation, might, however, be illustrated by symbols and resemblances borrowed from numbers.

Next to numbers, music had the chief place in the preparatory exercises of the Pythagorean school, by means of which the mind was to be raised above the dominion of the passions, and inured to contemplation. Pythagoras considered music, not only as an art to be judged of by the ear, but as a science to be reduced to mathematical principles and proportions. We have introduced, under the article PYTHAGORAS, the manner in which he is said to have discovered the musical chords, but shall here subjoin a more minute account. As Pythagoras was one day reflecting upon the subject, happening to pass by a smith's forge, where several men were successively striking with their hammers a piece of heated iron upon an anvil, he remarked, that all the sounds produced by their strokes were harmonious except one. The sounds, which he observed to be chords, were the octave, the fifth, and the third; but that sound which he perceived to lie between the third and the fifth he found to be discordant. Going into the workshop, he observed, that the diversity of sounds arose, not from the form of the hammers, nor from the force with which they were struck, nor from the position of the iron, but merely from the difference of weight in the hammers. Taking, therefore, the exact weight of the several hammers, he went home, and suspended four strings of the same substance, length, and thickness, and twined in the same degree, and hung a weight at the lower end of each, respectively equal to the weight of the hammers: upon striking the strings, he found, that the musical chords of the strings corresponded with those of the hammers. Hence it is said, that he proceeded to form a musical scale, and to construct musical instruments. His scale was, after his death, engraved in brass, and preserved in the temple of Juno at Samos.

Pythagoras conceived that the celestial spheres in which the planets move, striking upon the ear through which they pass, must produce a sound; and that this sound must vary, according to the diversity of their magnitude, velocity, and relative distance. Taking it for granted, that every thing respecting the heavenly bodies is adjusted with perfect regularity, he further imagined, that all the circumstances necessary to render the sounds produced by their motion harmonious, were fixed in such exact proportions, that the most perfect harmony is produced by their revolutions. This fanciful doctrine respecting the music of the spheres gave rise to the names which Pythagoras applied to musical tons. The last note in the musical octave he called hyper, because he supposed the sphere of Saturn, the highest planet, to give the deepest tone; and the highest note he called note, from the sphere of the moon, which being the lowest, or nearest the earth, he imagined, produced the shrillest sound. In like manner of the rest. It was said of Pythagoras by his followers, who hesitated at no allusion, however improbable, which might seem to exalt their master's fame, that he was the only mortal so far favoured by the gods as to be permitted to hear the celestial music of the spheres. Pythagoras applied music to the cure of diseases both bodily and mental. It was, as we have seen, the custom of his school, to compose their minds for rest in the evening, and to prepare themselves for action in the morning, by suitable airs, which they performed upon the lute, or other fringed instruments. The music was, however, always accompanied with verse, so that it may be doubted, whether the effect was to be ascribed more to the music or
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or to the poet. It is said of Clinius, a Pythagorean, that when he perceived himself inclined to anger, spleen, or other refractory passions, he took up his lute, and that it never failed to restore the tranquillity of his mind. Of Pythagoras himself it is related, that he checked a young man, who, in the midst of his revels, was meditating some act of Bacchanaalian madness, by ordering the musician, who had inflamed his passions by Phrygian airs, to change the music on a sudden into the slow and solemn Doric mode. If the stories which are related by the ancients concerning the wonderful effects of their music are to be credited, we must acknowledge we are strangers to the method by which these effects were produced.

Besides arithmetic and music, Pythagoras cultivated geometry, which he had learned in Egypt; but he greatly improved it, by investigating many new theorems, and by digressing its principles, in an order more perfectly systematic than had before been done. Several Grecians, about the time of Pythagoras, applied themselves to mathematical learning, particularly Thales in Ionia. But Pythagoras seems to have done more than any other philosopher of this period towards reducing geometry to a regular science. His definition of a point is, a monad or unity with position. He taught that a geometrical point corresponds to unity in arithmetic, a line to two, a superficies to three, a solid to four. Of the geometrical theorems ascribed to Pythagoras, the following are the principal: that the interior angles of every triangle are together equal to two right angles; that the only polygons which will fill up the whole space about a given point, are the equilateral triangle, the square, and the hexagon; the first to be taken six times, the second four times, and the third three times; and that, in rectangular triangles, the square of the side which subtends the right angle is equal to the two squares of the sides which contain the right angle. Upon the invention of this latter proposition (Euclid, I. i. prop. 47.), Plutarch says, that Pythagoras offered an ox, others, an hecatomb, to the gods. But this story is thought by Cicero inconsequent with the institutions of Pythagoras, which, as he supposes, did not admit of animal sacrifices. Pythagoras inferred the stature of Hercules from the length of the Olympic course, which measured six hundred of his feet. Observing how much shorter a course six hundred times the length of the foot of an ordinary-sized man was than the Olympic course, he inferred, by the law of proportion, the length of Hercules's foot; whence the usual proportion of the length of the foot to the height of a man enabled him to determine the problem. Pythagoras also applied geometrical ideas as symbolical expressions of bodies, and of natural principles; but nothing certain, or intelligible, is preferred on this head.

On astronomy, the doctrine of Pythagoras, or, however, of the ancient Pythagoreans, was as follows:

The term heaven either denotes the sphere of the fixed stars, or the whole space between the fixed stars and the moon, or the whole world, including both the celestial spheres and the earth. There are ten celestial spheres, nine of which are visible to us; namely, that of the fixed stars, those of the seven planets, and that of the earth; the tenth is the antichthon, or an invisible sphere opposite to the earth, which is necessary to complete the harmony of nature, as the decad is the completion of numerical harmony. And this antichthon may be the cause of the greater number of the eclipses of the sun than of the moon. Fire holds the middle place in the universe; or, in the midst of the four elements is placed the fiery globe of unity; the earth is not without motion, nor situated in the centre of the spheres, but is one of those planets which make their revolution about the sphere of fire. The revolution of Saturn is completed in thirty years, that of Jupiter in twenty, that of Mars in two, that of the Sun, and of Mercury and Venus, in one year. The distance of the several celestial spheres from the earth correspond to the proportion of notes in the musical scale. The moon and other planetary globes are habitable. The earth is a globe, which admits of antipodes.

From several of these particulars respecting the astronomical doctrine of Pythagoras, it has been inferred, that he was poffessed of the true idea of the solar system, which was revived by Copernicus, and has since been fully established by Newton.

From this preparatory study the disciples of the Pythagorean school were conducted to the knowledge of natural, theological, and moral science. Concerning wisdom, in general, Pythagoras taught, that it is the science which is conversant with those objects, which are in their nature immutable, eternal, and incorruptible, and therefore alone can properly be said to exist. The man who applies himself to this kind of study is a philosopher. The end of philosophy is, that the human mind may, by such contemplation, be assimilated to the divine, and at length be qualified to join the assembly of the gods. In the pursuit of wisdom, the utmost care must be taken to raise the mind above the dominion of the passions, and the influence of sensible objects, and to divest it from all corporeal impressions, that it may be inured to converse with itself, and to contemplate things spiritual and divine. For this purpose the affluence of God, and of good demons, must be invoked by prayer. Philosophy, as it is conversant with speculative truth, or with the rules of human conduct, is either theoretical or practical. Practical philosophy is only to be studied so far as may be necessary for the purposes of life; theoretical philosophy is the perfection of wisdom. Contemplative wisdom cannot be completely attained, without a total abstraction from the ordinary affairs of life, and a perfect tranquillity and freedom of mind. Hence the necessity of instituting a society, separated from the world, for the purpose of contemplation and study.

Active or moral philosophy, which prescribes rules and precepts for the conduct of life, according to Ariotoph, was first taught by Pythagoras, and after his death by Socrates. Among the moral maxims and precepts ascribed to Pythagoras are the following:

Virtue is divided into two branches, private and public. Private virtue respects education, silence, abstinence from animal food, fortitude, sobriety, and prudence. The powers of the mind are reason and passion; and when the latter is preferred in subjection to the former, virtue is prevalent. Young persons should be inured to subjection, that they may always find it easy to submit to the authority of reason. Let them be conducted into the best course of life, and habit will soon render it the most pleasant. Silence is better than idle words. A wise man will prepare himself for every thing which is not in his own power. Do what you judge to be right, whatever the vulgar may think of you; if you despise their praise, despise also their censure. It is inconsistent with fortitude to relinquish the station appointed by the Supreme Lord, before we obtain his permission. Soby is the strength of the soul, for it preserves its reason unclouded by passion. No man ought to be esteemed free, who has not the perfect command of himself. Drunkenness is a temporary phrenzy. That which is good and becoming is rather to be pursued, than that which is pleasant. The desire of superfluity is foolish, because it knows
PYTHAGOREANS.

The ancient Pythagoreans had a profound influence on Western philosophy, mathematics, and science. Their teachings were centered around the beliefs that all numbers and relationships were fundamentally divine and that the universe was governed by numerical and geometric principles.

Their philosophy was marked by a deep respect for the natural world and a belief in the interconnectedness of all things. They believed in the power of numbers and mathematics to reveal the truths of the universe, and they developed a system of numbers that they believed could explain the natural world.

The Pythagoreans were also known for their intense pursuit of knowledge and their rigorous method of inquiry. They believed that the soul was eternal and that education was essential for the development of the mind.

Their ideas were passed down through generations and influenced many of the great thinkers of the Western world, including Plato, who was one of the most prominent admirers of the Pythagoreans. Their influence can still be seen in the fields of mathematics, science, and philosophy today.

The Pythagoreans' work and teachings continue to inspire and influence generations, and their legacy remains a testament to the power of knowledge and the importance of pursuing truth and understanding.
contains spheres, which revolve with musical harmony. The atmosphere of the earth is a grofs, immutable, and morbid mass; but the air, or ether, which surrounds it is pure, heathful, serene, perpetually moving, the region of all divine and immortal natures. The sun, moon, and stars, are inhabited by portions of the divinity, or gods. The sun is a spherical body. Its eclipses are caused by the passing of the moon between it and the earth; those of the moon by the intervention of the antichthon, before explained. The moon is inhabited by demons. Comets are stars, which are not always seen, but rise at stated periods.

Concerning man, the Pythagoreans taught, that, consisting of an elementary nature, and a divine or rational principle, he is a microcosm, or combindium of the universe; that his soul is a self-moving principle, composed of two parts, the rational, which is a portion of the soul of the world, seated in the brain, and the irrational, which includes the passions, and is seated in the heart; that man participates in both these with the brutes, which, from the temperance of their body, and their want of the power of speech, are incapable of acting rationally; that the sensitive soul, ψυχή, perishes, but the rational mind, λογις, is immortal, because the source whence it is derived is immortal; that after the rational mind is freed from the chains of the body, it assumes an ethereal vehicle, and passes into the regions of the dead, where it remains till it is sent back to this world, to be the inhabitant of some other body, brutal or human; and that after suffering successive purgations, when it is sufficiently purified, it is received among the gods, and returns to the eternal source from which it first proceeded.

The doctrine of the Pythagoreans, respecting the nature of brute animals, and μεταφορα, the tranmigration of souls, were the foundation of their ablution from animal food, and of the exclusion of animal sacrifices from their religious ceremonies. The latter doctrine is thus beautifully represented by Ovid, who introduces Pythagoras as saying:

"Morte caret animal: semperque priore reliquit
Sede, novis domibus habitant, vivuntque receptae.
Omnia mutantur; nil aliut erat et illinc.
Huc venit, hic illic, et quotlibet occupet artus.
Spiritus, eque feris humanas in corpore transt.
Inque feras nona: nec tempore derelit utero.
Utque novis fragilis signatur cera figuris,
Nec manet ut fuerat, nec formas servavit exstrem.
Sed tamen ipsa eadem eit, animam lic cemer amidem,
Elle, sed in variis doceo migrate figuris."

"What then is death, but ancient matter dried
In some new figure, and a varied velt:
Thus all things are but alter'd, nothing dies;
And here and there the unbodied spirit flies,
By time, or force, or sickness dimples'd,
And lodges where it lights, in man or beast;
Or hunts without, till ready limns it find,
And actuates those according to their kind;
From temenent to temenent is toll,
The soul is still the fame, the figure only loit:
And as the foften'd wax new foals receives,
This face affumes, and that impression leaves;
Now call'd by one, now by another name.
The form is only chang'd, the wax is still the fame;
So death, thus call'd, can but the form deface,
Th' immortal soul flies out in empty space,
To seek her fortune in some other place."
"Periplus of the World," and he is supposed to have written a treatise "De Oceano," none of these pieces have reached modern times, though some of them were extant in the fourth century. From fragments collected out of Strabo, it appears that Pytheas introduced into them, as the testimony of others, a number of marvellous and incredible circumstances, which drew on him the censure of that author and Polybius. The last named author maintained it to be utterly impossible for a private person, who was even in want, to have travelled so far as he pretended to have done by sea and land. He, however, probably visited all the countries of Europe that are situated upon the ocean, discovered the island of Thule, or Iceland, and penetrated a considerable distance into the Baltic. This fact has been proved by Gaflendi, who shews, that Pytheas was well acquainted with the northern countries, and accurately marked the distinction of climates, by the difference which he observed in the length of the days and nights in different latitudes. He also attempts to prove that Eratosthenes and Hipparchus improved their geographical works by availing themselves of the labours of Pytheas, without due acknowledgments of their obligations. There is no doubt that Pytheas was a skilful observer of the heavens, for he taught that there is no star in the precise situation of the pole, and he rendered himself famous among astronomers, by being the first calculator of the meridian altitude of the sun at the summer solstice at Marseille. This fact he ascertained by erecting a gnomon of a given height, and finding the proportion between that height and the length of the meridian shadow. The result was found to correspond exactly with that of an observation made by Gaflendi, at the same place, in the year 1636. To obviate such objections as that advanced by Polybius against the reality of Pytheas' voyages, it has been said, that he probably was furnished with the means of prosecuting them at the public expense. For as the republic of Marsilles was then powerful at sea, largely engaged in commercial pursuits, and lent Euthymenes to make such discoveries in the southern parts of the world, as might lead to the extension of its trade, it seems very probable, that Pytheas was dispatched on the public account into the northern regions for the same purposes.

PYTHEUM, in Ancient Geography, a town of Macedonia, in the country of the Pelignitores. Ptolemy places it between Azorium and Gonnas.

PYTHIA, or PYTHIAN, in Antiquity, the priestesses of Apollo, by whom he delivered oracles. See DELPHI.

She was thus called from the god himself, who was entitled Apollo Pythius, from his slaying the serpent Python; or, as others will have it, αφων τε πυθιανος, because Apollo, the fun, is the caufe of rotenness; or because the carcasse of Python was left there to putrefy; or, according to others, πυθιανος, I enquire, because people went to hear and consult his oracles.

This priestess was to be a pure virgin. She sat on the cocusf, or lid, of a brazen vessel, mounted on a tripod; before she ascended which, after fasting three days, she used to wash her whole body, and especially her hair, in Castalia, a fountain at the foot of Parnaiss, where the poets, men inspired by the same deity, used to wash, and drink; and thence, after shaking the laurel-tree that grew by it, and sometimes eating the leaves, which were supposed to conduco to inspiration, and were succeeded by a violent enthusiasm, she delivered her oracles, or rather explained those of the god; i.e. she reheared a few ambiguous and obscure verses, which were taken for oracles. The oracle being pronounced, she was taken down from the tripod and conducted back to her cell, where she continued for several days, to recover herself from the violent agitation and conflict. Lucan informs us, that speedy death was frequently the consequence of her enthusiasm. See ORACLE.

Diodorus Siculus (lib. xvi.) informs us, that these priestesses were at first virgins, but that after one of them was delivered by Echeocrates, a Thessalian, choice was made of women above fifty years of age; that fo they might either be secured from the attempts of lust, or if they should at any time be forced to the violation of their chastity, having passed the time of child-bearing, they might remain undiscovered, and not bring the oracle of religion into contempt; nevertheless they wore the habit of virgins, thereby to signify their purity and virginal modesty.

All the Pythiae did not seem to have had the same talent at poetry, or to have memory enough to retain their lesson. Plutarch and Strabo make mention of poets, who were kept in pay, as interpreters of Jupiter, &c.

PYTHIA, or PYTHIAN Games, were solemn games instituted in honour of Apollo, and in memory of his killing the serpent Python with his arrows.

The Pythia were celebrated in Macedonia, in a place called Pythium. They were next in fame after the Olympic games, but were more ancient than they; for it is pretended they were instituted immediately after the defeat of the serpent. The Pythia were also celebrated at Delphi; and they were thefe that were the most renowned. Their first founder, and the precise time of their institution, are not known.

The Pythian games, according to Pausanias, were first instituted by Jafon or Diomedes, king of Etolia, and restored by Eurylochus of Theifaly, in the third year of the 48th olympiad, or the year of the world 3364, and 584 years before the birth of Christ; from which time the Greeks reckoned sometimes by Pythiades, as they had been accustomed to do by Olympiads. They were at first celebrated every eight years, but afterwards every four years, in the third year of each olympiad; so that the pythiade, which was a term of four years, served as an epocha for the inhabitants of Delphi. At first they consisted of poetical and musical contests, but in process of time they confin'd of the other exercies of the pnesacrarium, which were performed in the Olympic games. The victors were crowned with branches of laurel; though, at the first institution, the crown was of beech-leaves. The Romans are said to have adopted these games in the year U.C. 642, and to have given them the name of Apollinaires ludi.

A part of Pindar's poems was composed in praise of the victors in the Pythian games. See GAMES.

The critics are divided on the subject of the serpent Python. The poets say, that Juno made use of it to persecute Latona, and prevent her bringing into the world Apollo and Diana, whom she had conceived of Jupiter; and that it was for this reason that Apollo afterwards killed it.

Strabo says, it was no other than a famous villain, one Draco, that Apollo freed the world from. Dickinison, in his "Delphi Pheniceizantes," maintains the Python of the Greeks to be the Typhon of the Phenicians; and the Typhon of the Phenicians to be the Og of Scripture; and Apollo, who slew it, he will have to be Jofhua. See TYPHON.

PYTHON, in Ancient Geography, a name anciently given to the city of Delphi.

PYTHOPOLIS, a town of Aia Minor, in Bithynia, on the river Solonnt, according to Plutarch, founded by Thefeus.
PYX

Thefeus.—Alfo, a town of Aria Minor, in Caria; afterwards called Nifia.—Alfo, a town of Afismatic Myfia.

PYULCON, from πυξις, πυξ, and ἄλλως, to draw, an old surgical instrument anciently employed for drawing the matter out of ulcers.

PYURIA, in Medicine, from πυξις, πυξ, and υρος, υριν, a term used by Sauvages and others to denote all purulent and mucous discharges from the bladder. See CATTARRHUS Vefier.

PYXIDANTHERA, in Botany, from πυξις, a box, and ἀνθήρα, an anther, becaufe, according to Michaux, each cell of the anthers opens by a port of lid; see Diaphorhia, to which genus the plant in question is referred by Mr. Pursh, in his Fl. Amer. Sept. v. 1. 148, under the name of D. cuneifolia, after Mr. Salisbury.

PYXIS Nautica, in Navigation, the feaman’s compass. The word πυξις, literally signifies a box.

Pyxis, among Anatomists, is also used for the cavity of the hip-bone. See Acetabulum.

PYXIS, a small metal cafe for containing the consecrated species in the Catholic church. Anciently it was made in the form of a dove and fulpended over the altar.

PYXUS, in Ancient Geography, a small river of Italy, in Lucania; which took its rife northward towards Sonitia, and running southward discharged itself into a gulf of the fame name, E. of Pyxus, or Pyxuntum.

Pyxus, or PYXUNTUM, Poli-Caffro, a town of Italy, belonging to Lucania, situated at the bottom of a small gulf, E. of a small river of the fame name. It was founded by Mirathus, prince of Zanele and Rhegium, in the year 471 B.C. It became a Roman colony in the year 194 before the fame era.

PYXUS Promontorium, a small cape of Italy, E. of a peninsula of Laconia, which had on the W. the promontory Paliurnum. This promontory is found at the entrance of a small gulf of the fame name.

PYZENENIN, in Geography, a town of Bohemia, in the circle of Bolefau; 12 miles E. of Jung-Duntzel.

Q.

A confonant, borrowed from the Latin or French, for which the Saxons generally used cp, cow; and the sixteenth letter of the alphabet.

The name of this letter is cu, from queue, Fr. tail; its form being that of an O with a tail.

The Q has this peculiarity to it, that it is always followed by an U, and is therefore reckoned among the mutes.

The Q is formed from the Hebrew, q, koph; which most other languages have borrowed; though some of them have rejected it again, particularly the Greeks, who now only retain it as a numeral character, called μονετα ιωνικουν.

In effect, there is that resemblance between the Q and the C, in some languages, and the K, in others, that many grammarians, in imitation of the Greeks, banish the Q as a superfluous letter. Papas even affirms, that all the Latin words now wrote with a Q, were written among the ancient Romans with a C; but we want better authorities for this.

For, though that may hold in many cafes, inomuch that some write indifferently quer, or cu; cum, or quam; quotidie, or continet, &c. yet it does not thence follow, that they ever wrote cita, cæ, cid, for quis, quer, quid. What inscriptions authorize such a reading?

Far from this, the ancients sometimces substituted Q for C; and wrote quojus, quasi; for cujus, cui, &c.

Varro, however, and some other grammarians, as we are told by Cenorumus, &c. would never use the Q. The truth is, its use or dilute seems to have been so little settled, and agreed on, that the poets used the Q or C indifferently, as belt suited their measures; it being a rule, that the Q joined the two following vowels into one syllable; and that the C imported them to be divided.

Hence it is, that Lucretius ues ecuit for three syllables, in lieu of quirit; aequus, for aequa, and that Plautus ues rellicum, for reliquum; as in quod debil,datum non vellem reliquum.

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PYZ.

Q, where the cum must be two syllables, otherwise the trochaic verse will be lame of a foot.

In the French, the sound of the Q and K are so near akin, that some of their neice authors think the former might be spared. Ramus adds, that, till the establishment of royal professors in the university of Paris, under Francis I., they always used Q in the Latin the fame as in the French; pronouncing his, kalis, kantus, &c. for quis, qualis, quantus. See K.

Some very learned men make Q a double letter, as well as K and X. According to them, Q is evidently a C and U joined together. It is not enough that the sound is the fame, but they see the traces of the C U in the figure of the Q; the V being only laid obliquly, fo as to come within the cavity of the C; as c <.

To confirm this, they say the ancients wrote qi, qua, quid. Though Jof. Scaliger, Littleton, &c. think this is no proof of the point; for in Gruter’s inscriptions we find not only the Q, but also the C, put for Q U; as Cintus, Quintus; feius for fiquis, &c. Yet nobody ever imagined the C a double letter.

Q, among the Ancients, was a numeral letter, signifying 500; as in the verse,

"Q velut A cum D quingentos vult numerare."

A dash over it, as $\bar{Q}$, denoted it to signify five hundred thousand.

Q is also ued as an abbreviation in several arts. Q. pl. in physicians’ bills, stands for quantum placet, or quantum vis, as much as you please of a thing; q. f. for quantum sufficit, or as much as is necessary.

Q, in the proper names of the Romans, signifies Quintus, or Quintus. Upon the French coins this letter denotes that they were struck at Perpignan.
Q. D. is frequently used, among Grammaticus, &c. for quæst dition, as if it were laid, &c. or as who should say.

Q. E. D. among Mathematicians, signifies quod erat demonstrandum, which was to be demonstrated.

Q. E. F. quod erat factandum, which was to be done.

QUAB, in Ichthyology, the name of a Ruffian fish, which some report to be at first a tadpole, then a frog, and at last a fish. Dr. Mooney, who made many enquiries concerning these pretended changes, apprehends that they are all fabulous. He had an opportunity of seeing the fish itself, and found that they spawn like other fishes, and grow in size, without any appearances to justify the report. He adds, that they delight in very clear water, in rivers with sandy or stony bottoms, and are never found in running lakes, or in rivers palling through marshy or morly grounds, where frogs choose most to be. Phil. Trans. vol. xlv. p. 175.

QUABES, in Geography, a people of Africa, in the interior country between Río Seffer and Sierra Leona, inhabiting the southern banks of the river Seffer. They had been formerly conquered by Flanlto, king of Folgia; but having thrown off their subjection, they have since remained a free people, though under the protection of the emperor of Monon, or Manou; which empire is called by English geographers, and also by M. d’Aville, Mendi Manouo.

QUACHA, or Quaga, in Zoology. See Equus.

QUACHILTO, in Ornithology, the name of a very beautiful Braziland bird, of the moor-hen kind, called also yacaciuli, and porphyro Americanus. It is the Fulica Purpurea, (which fee;) and is of a fine blackish purple colour, variegated with white; its beak is white while young, but becomes red as it grows older, and has a naked space at its basis, resembling, in some sort, the coot; its legs are of a yellowish green; it lives about the waters and feeds on fish, yet is a very well-tasted bird. It imitates the crowing of a common cock, and makes its music early in the morning. Marggraves’s Hift. Brazil.

QUACHY, in Zoology, a name given to the Coati, or Viverra Naja; which fee.

QUACK, in Medicine. See Empiric.

QUACKENBRUCK, in Geography, a town of Westphalia, in the bishopric of Osnabruck, situated on the river Hafo, which runs through it in seven streams, that unite in two below the town; 20 miles N. of Osnabruck. N. lat. 52° 42;' E. long. 8° 30'.

QUADIANS, Quadi, in Ancient Geography, a people of Germany, whose territories extended from the Danube to Moravia, and the northern part of Austria. They are comprehended by some writers under the ancient name of Suevi, part of whom forced their way into Spain, and formed a kingdom there. Their country is at present known by the name of Moravia; for it extended from the mountains of Bohemia to the river Marus, now the March, and consequently comprised that province. Ptolemy mentions the following cities in the country of the Quadi; viz. Eburodum, Eburum, Medofalnium, and Celemantia, now, according to Cluerius, Briu, Omlutz, Zasim, and Kalminz. The Quadians were a warlike people, had kings of their own, and agreed in customs, manners, and religion, with the other German nations. They, without doubt, joined their countrymen against Lollius, Germanicus, Caius, and Galba, who attempted to reduce Germany, and to subdue the several nations which inhabited that extensive country. The emperor Domitian marched against them, but was defeated by the Marcomann, and put to flight. The Quadians submitted to the emperor Titus Antonius, and it appears by his coins, supposing to have been struck about the year 139, that they acknowledged, as sovereign, a king appointed by that prince. They joined the Marcomans, in the famous war made by that people on the empire under the reign of Marcus Aurelius; but being reduced to great distresses they sent ambassadors to sue for peace, and with them they restored all the Roman defeters, and about 13,000 prisoners, whom they had taken during the war. They thus obtained peace, upon condition, that they should not traffic, for the future, within the Roman dominions, nor settle within six miles of the Danube; but, differing these conditions, they again joined the Marcomans, and renewed the war. In the prosecution of this contest, which was long and languid, they were totally defeated by their king Ariodes, but the emperor spared his life, confining him to the city of Alexandria, the metropolis of Egypt. The Quadians, however, seem to have continued in arms till the reign of Commodus, who granted them peace upon the following terms: that they should keep at the distance of five miles from the Danube; that they should surrender their arms, and supply the Romans with a certain number of troops when required; that they should assemble but once a month in one place, and in the presence of a Roman centurion; and that they should not make war upon the neighbouring nations without the consent of the people of Rome. In the year 214, the king of the Quadians was Gaio compost, who was affiliated by order of Caracalla. In the 4th year of the reign of the emperor Valerian, the Quadians joined the Sarmatians, and invading Illyricum, ravaged that province; but they were defeated by Probus, then tribune of a legion, and afterwards emperor. In the year 260, the 7th of the emperor Gallicius, they made a sudden irruption into Panon, but they were expelled, without their booty, by Regilianus. Upon the death of Probus, who had kept the barbarians in awe, A.D. 283, the Quadians, in conjunction with the Sarmatians, broke into Illyricum and Thrace, and having ravaged those provinces, and advancing towards Italy, they were met by Carus, the successor of Probus, on the borders of Illyricum, and totally defeated: 16,000 being killed on the spot, and 20,000 being taken prisoners. In the 15th year of the emperor Constantinus, the Quadians made an irruption into Pannonia and Media; and having pillaged both provinces, returned home with an immense booty. They returned again in two years, and laid waste Valeria. Constantinus was provoked by these invasions, and leaving Milan, advanced to the confines of the Quadians, and conferred with their chiefs, who excused past hostilities, and promised, for the future, to live in peace and amity with the emperor. They soon, however, forgot their promise; and in the following year joined the Sarmatians, and laid waste a part of Pannonia and Media; but at the approach of Constantius, they repulsed the Danube, and returned home. The emperor determining to punish them for their treachery, sailed the Danube on a bridge of boats, and began to destroy their country. The Quadians, unable to resist, fled for peace, and obtained it, upon delivering up hostages, and setting at liberty all the prisoners they had taken. In the year 374, their king Gabinhus being treacherously murdered by Marcellianus, duke of Valeria, they crossed the Danube in the utmost rage, and falling upon the reapers, in harvest time, killed the greatest number of them, laid waste the country, and took many captives. They afterwards followed Equius, general of the troops in Illyricum, who had been
accessory to the murder of their king, into Valeria, and
committed dreadful devastations in the countries through
which they passed. In their way they met with two legions,
the Pannonian and Macedon, who had been sent to oppose them,
and taking advantage of a contest which subsisted among
them about precedence, they cut them both in pieces.
In this irruption the Quadians had been joined by the Sar-matians; but the latter were defeated with great slaughter
by Theodosius, then duke of Media, and afterwards em-
peror. Against the Quadians Valentinian I. marched in
person; and having made great preparations for his pro-
posed expedition into their country, he took the field;
passed the Danube at Acinicum, now Gran, or Buda, in
Lower Hungary, entered the enemy's country, and de-
stroyed it with fire and sword. At length, the Quadians
fued for peace; but whilst the emperor was speaking to the
messenger with great warmth, and threatening to extirpate
their whole nation, he fell to the ground in a fit, and soon
afterwards expired. Upon his death a treaty was con-
cluded with the Quadians. Their refiepts spirit and dis-
position for war manifested themselves again in the year 379,
when they invaded Illyricum; but they were driven out,
with some losSs, by the emperor Gratian. In 457 they
entered Gaul with the other barbarians, over-ran its pro-
vinces, and committed dreadful ravages. From this time
no farther mention is made of the Quadians; so that they
were either subdued, or utterly extirpated by the Goths,
vol. xviii.

QUADRISME, a term sometimes used for
the time of Lent, because confusing of forty days.

Hence some monks are said to lead a quadragesimal life;
or to live on quadragesimal food all the year.

QUADRAGESIMA Sunday is the first Sunday in Lent; so
called because it is about the fortieth day before Easter.

On the same account, the three preceding Sundays are
called Quinquagesima, Sexagesima, and Septuagesima.

QUADRAGESIMALS, QUADRAGESIMALIA, denote
Mid-lent contributions, or offerings.

It was an ancient custom for people to visit their mother-
church on Mid-lent Sunday, and to make their offerings at
the high altar; and the like was done in Whit-fen-week.
But as these latter oblations, &c. were sometimes commut-
ed for by a payment of pence to florins, or Whit-fen-farthings; so
were the former also changed into a customary payment,
known as graduals, denarii quadragesimalia; and sometimes
Letare, Jerusalem, from a hymn so called, sung on that
day, beginning "Jerusalem, mater omnium," &c.

QUADRANGLE, in Geometry, a quadrangular, or
quadrilatera figure; or a figure which has four sides, or
four angles.

To the class of quadrangles, or quadrangular figures,
belong the square, parallelogram, trapezium, rhombus, and
rhomboids.

A square, &c. is a regular quadrangle; a trapezium, an
irregular one.

Quadrangular figures are not proper for fortification; the
flanks, and flanked angles, being too small.

QUADRANGULARIS Pisces, the Square-fish, in
Ichthyology, the name of a fish, which, in its most usual size,
is about fifteen inches long, four inches high in the middle,
and three inches and a half over; the forehead is square, a
little hollow, and, by the eminence of the eye-brows, two
inches and a half over; the nose blunt, and not very steep,
with two holes in the place of nostrils, and the mouth very
small; the back is a little convex toward the tail, and on the
sides a little obtusely angled; as is also the belly, which is
plain and flat, and a little rising toward the tail; it has five
fins, two near the gills, two near the tail, and the tail-fin,
which is considerably long. Part of the head and tail are
covered with a soft skin, the rest of the body with a kind
of cloth, adorned all over with little round knots, reduced
for the most part into hexagonal figures, and subdivided

QUADRANS, in Antiquity, the fourth part of the as,
or pound. See As.

QUADRANS, in our Cents, is the fourth part of a penny,
or a farthing.

QUADRANT, QUADRANS, in Geometry, an arc of a
circle, containing 90 degrees, or one-fourth of the entire
periphery.

Sometimes, also, the space, or area, included between
this arc and two radii, drawn from the centre to each ex-
tremity thereof, is called a quadrant, or, more properly, a
quadrantal space; as being a quarter of the entire circle.

QUADRANT also denotes a mathematical instrument, of
great use in navigation and astronomy, for the taking of al-
itudes, angles, &c.

The quadrant is variously contrived, and furnished with
different apparatus, according to the several uses for which
it is intended; but they have all this in common, that they
confist of a quadrant, or quarter of a circle, whose limb is
divided into 90 degrees; and that they have a plummet sus-
hended from the centre; and are furnished with pinnules
or sights, through which to look.

QUADRANT, the Common, or Surveying, (represent-
ed Plate VI. Surveying, fig. 13.) is made of brass, wood, or
other matter, usually twelve or fifteen inches radius. Its
circular limb is divided into 90°, and each of these subdivi-
ded into as many equal parts as the space will allow, either
diagonally or otherwise. On one edge, or semi-diameter,
are fixed two immovable sights; and in the angle, or centre,
is hung a thread, with a plummet. To the centre is like-
wise, sometimes, fixed a label, or moveable index, bearing
two other sights, like the index of a telescope. And, in
lieu of the immovable sights, there is sometimes fitted a
telephone; though this more peculiarly belongs to the as-
umetrical quadrant.

On the under side, or face, of the instrument, are fitted
a ball and socket; by means of which it may be put in any
position, or use.

Besides the essentials of the quadrant, there is frequently
added on the face, near the centre, a kind of compartiment,
called the quadrat, or geometrical square; as in the figure
this, in some measure, making a distinct instrument of itself.
See its description and use under the article Quadrat.

The quadrant is to be used in different situations, ac-
tording to the dimensions to be taken. To observe heights
and depths, its plane is disposed at right angles to the ho-

Heights and distances, again, may be taken two ways;
QUA

by means of the fixed sights and plummet, and by the label.

**Quadrant, Use of the Surveying.** To take the height or depth of an object with the fixed sights, and plummet.—Place the quadrant vertically, and the eye under the sight next the arc of the quadrant; thus direct the instrument to the object, e.g. the top of a tower, till the visual rays of it strike through the sights upon the eye.

This done, the portion of the arc intercepted between the thread and the semicircle, on which the sights are fastened, shows the complement of the object's height above the horizon, or its distance from the zenith; and the other portion of the arc intercepted between the thread and the other semicircle, shows the height itself of the object above the horizon.

The fame arc likewise gives the quantity of the angle made by the visual ray, and a horizontal line, parallel to the base of the tower.

Note, to observe depths, the eye must be placed over that light next the centre of the quadrant.

From the height or depth of the object in degrees thus found, which supposeth 35' 35", and the distance of the foot of the object from the place of observation carefully measured, which supposeth 47 feet; its height or depth in feet, yards, &c. is easily determined by the most common cafe in trigonometry.

For we have here, in a triangle, one side given, viz. the line measured, and we have all the angles; for that of the tower is always supposeth a right angle; the other two, therefore, are equal to another right angle; but the angle observed is 35° 35", therefore the other is 54° 25'.

The cafe, then, will be reduced to this: as the sine of 54° 25', is to 47 feet, so is the sine of 35° 35' to a fourth term, viz. 35 feet; to which add the height of the observer's eye, supposeth 5 feet; and the sum, 38 feet, is the height of the tower required.

**Quadrant, the farther use of the, in taking of altitudes of objects, both accessible and inaccessible, lie under the article Altitude.**

**Quadrant, Use of the, in taking heights and distances by the index and sights.**—To take, e.g. a height, as that of a tower whose base is accessible; place the plane of the instrument at right angles to the plane of the horizon, and one of its edges parallel to it, by means of the plummet, which, in that cafe, will hang down along the other. In this situation turn the index, till, through the sight, you see the top of the tower; and the arc of the limb of the quadrant between that side thereof parallel to the horizon and the index will be the height of the tower in degrees; whence, and from the distance measured as before, its height in feet, &c. may be found by calculation, as in the former cafe; or, without calculation, by drawing from the data, on paper, a triangle similar to the great one, whose base is the distance; and its perpendicular, measured on the scale, is the height of the tower.

**Quadrant, Use of the, in measuring horizontal distances.**—Though the quadrant be a lefs proper instrument for this purpose than a theodolite, semicircle, or the like, because angles greater than quadrants cannot be taken by it, yet necessity sometimes obliges persons to have recourse to it.

The manner of its application is the fame with that of the semicircle; all the difference between the two instruments consisting in this, that the one is an arc of 180°, and can therefore take an angle of any quantity; and the other is only an arc of 90°, and is therefore confined to angles of that quantity. See, therefore, Semicircle.

**Quadrant, in Astronomy, is an instrument by which the altitude of a heavenly body is measured, and is composed of one-quarter, or one-eighth of a circle, accordingly as the measurement is made by means of direct vision, or by the reflected image of the object to be viewed. When a suffused circle was made use of with revolving sights, called an astrolabe, the accuracy of an observation could never be depended on, partly because the radius was small, and partly because the instrument vibrated when suffused by the hand, and was otherwise inconvenient to use, as well as liable to have its equinoctial disturbed by the various positions of the index and sights: therefore, such a portion of the circle was adopted as was competent to measure the greatest possible altitude, and an increase of radius was thereby obtained, which promised to contribute to accuracy, without affecting the portability of the instrument. But though the construction was varied by different ingenious men, the quadrant was but little, if at all, conducive to the improvement of nautical or of astronomical science, till the application of telescopic sights, and an improved mode of graduating the limb, together with the addition of a vernier scale, gave it powers on which the mariner and astronomer could confide. Quadrants have been constructed of different materials, such as wood, ivory, brass, &c. and of various dimensions, agreeably to the uses for which they were intended, in order to accommodate purchasers of every denomination; but as it is not our province to notice every plaything that has usurped the appellation of quadrant, we will confine our account to such instruments chiefly as have been of actual service in navigation and astronomy. We have, however, already anticipated the history, we might here have introduced, of the various improvements successively made in quadrants, at the beginning of our article Circle; and under the article Graduation we have given, at considerable length, the different methods of dividing and subdividing astronomical instruments in general; to which articles we beg to refer our readers, who wish for information on those points, and which may be read in conjunction with our present article.

Our arrangement of quadrants will be most systematic, if we divide them into two classes, viz. those which measure altitudes by direct vision, and those which determine measurements in all directions, vertically, horizontally, and obliquely, by means of reflection. The former classes have been found useful in astronomy chiefly, and the latter in navigation, where the motion of a ship interferes with the readiness of any fixed position of an instrument.

The first quadrant, in its rude form, was probably a quarter of the astrolabe enlarged, with fixed sights placed in, or parallel to, the vertical line passing through zero; and a fine thread, or wire, stretched by a plummet, indicated the altitude on the divided limb, according to the representation in fig. 4, of Plate I. of Astronomical Instruments. This construction might be used in observations of the sun, without injuring the eye of the observer, by allowing the solar rays to pass through the first sight-vane, or hole, so as to fall on the second, at some distance from the former, while the thread rested nearly in contact with the elevated limb; but the want of minute, and at the same time accurate subdivisions, and the sensible thickness of the thread, were impediments to accuracy that did not admit of remedy, until another mode of reading the altitudes was devised, and until a method was contrived of rendering the light of the sun tolerable to the eye of an observer. The form of these reflectors was accomplished first by diagonal scales, with a fiducial edge of an index, and afterwards by that admirable contrivance, sometimes called a Nonius, but more properly denominated a Vernier, from the name of its inventor;
QUADRANT.

DISTINCTION; the latter was effected by semi-opaque glasses, introduced at first without, but afterwards, with better effect, with telescopic sights; at the same time, enlarging the visual angles subtended by the fun, and yet diminishing the intensity of his light by a partial transmission through the smoked or coloured glasses.

Davis's Quadrant, or Back-Staff.—In the year 1590, captain John Davis, a native of Sandridge, near Dartmouth, previously to his falling into the south seas under the command of Mr. Cavendish, contrived that instrument, which is represented in fig. 2, of Plate I. of Astronomical Instruments, and which has been called the English quadrant, or back-staff. This instrument dispensed with the use of the plumb-line, and consequently was better adapted to nautical purposes than the old quadrant, or the fore-staff, that preceded it; but wanted the telescopic fights, which have given subsequent instruments the advantage over it. It was, however, probably the first quadrant in which the horizon was used as one of the objects in a back observation, and from which the reflecting images afterwards borrowed an useful principle, where altitudes are concerned; though it was in the use of the fore-staff, (described under our article CIRCLE,) that the horizon was first made one of the extreme limits of an altitude, taken by a forward observation. Captain Davis found that near-tree answered very well as the material on which his instrument was constructed, and an ingenious arrangement of two divided arcs and three vanes constituted his plan, according to the following description. The vane at A was called the horizon-vane; the one seen at B the shade-vane, because its shadow fell on the horizon-vane during the instant of completing an observation; and the third, at C, was denominated the fight-vane, by reason of its being the vane to which the eye was applied in taking an observation. The arc of smaller radius, DE, contained 60°, and the other, FG, of larger radius, contained only 30°, in continuation of the former, making together the whole quadrant. The arc DE was divided into whole degrees only, on account of the smallness of its radius; but the arc FG had its degrees subdivided by concentric and diagonal lines, as seen in the figure. The manner of ascertaining the altitude of a heavenly body, by the joint use of these two arcs, is not obvious at first sight of the instrument, but may be thus explained. When the altitude of the fun is taken, the horizon-vane is fitted to the extreme end or centre A of the quadrant, and the shade-vane B is put to within about 10° or 15° of the supposed co-altitude, but to a less quantity than the co-altitude, while the fight-vane remains for adjustment on the arc FG. Things being in this state, the back of the observer is turned to the fun, and the quadrant is so elevated, that the shadow of the upper edge of the shade-vane B falls upon the upper edge of the slit in the horizon-vane A, when viewed through the small hole in the fight-vane. If now, in this situation, the horizon is seen through the said slit, the observation is exact; but if not, the fight-vane is moved backwards or forwards on the arc FG, accordingly as the sky or sea is seen, till the horizon appears in its place, while the shadow of the shade-vane rests on the required slit in the slit of the horizon-vane, and then the observation is finished; and the sum of the two readings on the respective arcs, B and C, as read by the fiducial edges of the vanes, is the co-altitude or zenith distance of that limb of the fun, upper or lower, which was observed from the corresponding limb of the shadow. If a lens, of a focal length equal to the radius of the smaller arc, were used, the focal luminous point occasioned thereby would be a better object to measure the place of, than a shadow with an edge not sufficiently defined. This instrument, it should seem, was not capable of taking the altitude of a star or planet, nor of the moon, unless her disc was large enough at the time to project a shadow.

Elton's Quadrant.—An index bearing a spirit-level, with a vernier scale near the sight-vane, was added to the quadrant of Davis some time afterwards, by one Elton, the use of which was to take altitudes without an horizon; but the similarity of the two instruments renders a more particular description of this addition superfluous. An inspection of fig. 8. Plate I. will sufficiently explain the difference.

Gunter's Quadrant.—Among the numerous and useful contrivances of the ingenious professor of astronomy in Gresham college, was a portable quadrant, which now claims our attention, and which was contrived in, or a little before, the year 1618. The object of the inventor was not to construct an instrument capable of measuring altitudes more accurately than that of captain Davis, which we have just described, but to make a quadrant so comprehensive in its uses, that, like the logarithmic scale, which he divided, it might thence by inspection results, which had previously required long and tedious calculations; and in this point of view it is still to be considered. Besides the quadrantal arc for measuring altitudes, this instrument has various curves stereographically projected on it, such as the equator, the tropics, the ecliptic, and the horizon, on a supposition that the eye is situated in one of the poles, all which are represented in fig. 3. of Plate XXIII. of Astronomical Instruments. The projection, according to Bion, is thus effected: when the quadrantal arc BC has been graduated, from its centre A, with a convenient radius AT, describe the arc TD to represent one of the tropics; and let the line AT be taken as the tangent of 56° 46', or half the sun's greatest declination (supposed here to be 31° 32'), added to the radius or tangent of 45°; then to find the point E in this line for the equinoctial, there will be this proportion, as the tangent of 56° 46' : 1000 :: radius : 655; and therefore, if 4900 parts of the line AT be taken, it will be the proper radius of the arc EF, or equinoctial.

To find the centre of the occult arc ED, which represents the ecliptic, let the meridional line AD be divided by the point G, that if AF be taken as radius, AG may be the tangent of 23° 31', the sun's greatest declination; in which case AG will be 27° of the line AF, and the occult arc ED described from the point G will be one-fourth of the ecliptic, which may be divided into signs and degrees thus: as radius is to the tangent of any degree's distance from the nearest equinoctial point, so is the co-line of the sun's greatest declination, to the tangent of that degree's right ascension; for example, supposing the right ascension of the first point of A to be 25° 54', draw a line from A, the centre of the quadrantal arc, to this degree and minute on the said arc, and note where it intersects the occult arc of the ecliptic, and this point will be the beginning of the sign; and in like manner any other part may be inferred.

The line ET, or line of declination, may be divided thus: that the radius for the radius of the equinoctial, or tangent of 45°, let the tangents of 46°, 47°, 48°, &c. up to 68° 30', be successively taken and laid down on the line ET, and the points of excess above the tangential point of 45° will be the dividing lines of the scale for 1°, 2°, 3°, &c. up to 23° 32', or greatest declination.

When the scale of declination is finished, the quadrantal arc may be taken as the measure of right ascensions, and then the place of a star or any other heavenly body may be inferred on the plane of the quadrant thus: let a line be drawn

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drawn from A to the degree and minute of right ascension, counted from B towards C, and the point in this line, where an occult arc, drawn through the declination from the centre A, intercepts it, will be the place of the heavenly body in question.

The two parallel arcs contained between the tropic T D and the quadrantal arc B C, are the scales of days and months, which are divided by the aid of a table of meridian altitudes of the sun for each day, calculated for the particular latitude, for which the quadrant is constructed. It is hardly necessary to observe, on the construction of such table, that if the latitude and declination be both north, or both south, the declination must be added to the co-latitude for the greatest altitude; but if of contrary denominations, subtracted. The degrees and minutes contained in such table are transferred into the scale of months by a line extending across it from the centre A to the quadrantal arc, as before.

The centre of the horizon will be in the meridional line A C, and if a point H be taken such, for the co-latitude 38° 28' for instance, that A H may be the corresponding tangent to radius A F, then \( \frac{28}{28} \) of that radius will be its distance from A, and the occult arc described from H in the extent HE, begins at E in the equinoctial, and ending at the tropic T D, will be the required horizon. This horizontal arc may be divided thus; as radius is to the sine of the latitude, so is the tangent of any number of degrees in the horizon, to the tangent of a corresponding arc in the quadrant; and from a table thus constructed any point in the horizon may be put in by intersecion of a line drawn from A to the tabular number as read on the quadrantal arc, as in the former cases.

A third table of the sun's altitude for inferring the hour lines may be calculated thus; when the sun is in the equator, as radius is to the co-sine of the latitude, so is the co-sine of any hour from the meridian, to the sine of the sun's altitude at that hour; but when the sun has declination, say, as the co-sine of the hour from the meridian is to radius, so is the tangent of the latitude, to the tangent of a fourth arc; then if the latitude and declination have like denominations, and the hour fall between noon and six o'clock, subtract the declination from the said fourth arc, and the remainder will be a fifth arc; but if the latitude and declination have unlike denominations, or the hour be between six and midnight, add the declination to the fourth arc, and the sum will be a fifth arc, which must be thus used; as the sine of the fourth arc, is to the sine of the latitude, so is the co-sine of the fifth arc, to the sine of the altitude sought. The determina-

fication of such table by this fundamental method is however opaque, and Margett's horary tables, which give the successive altitudes in any given latitude, would greatly shorten the labour, by giving the results by inspection, which may at the same time be inferred by transfers from the quadrantal arc, similar to those we have already described. When the horary points are put in for each successive hour, when the sun is in the equator, at each tropic, and at a few intermediate places, the horary lines may be drawn through the said points, which will give the hour for any given day, when the instrument is used as hereafter described.

A fourth table, for putting in the azimuth lines, will require the sun's altitude to be calculated for each degree of azimuth, when the sun is at the equator, at each tropic, and at other intermediate places, which may be done thus: when the sun is in the equator, as radius is to the co-sine of the azimuth from the meridian, fo is the tangent of the latitude, to the tangent of the sun's altitude at the azimuth in the equator: but out of the equator the rule is, as the sine of the latitude, is to the sine of the declination, so is the co-sine of the sun's altitude at the equator at a given azimuth, to the sine of a fourth arc.

The latitude and declination have the same name, in all azimuths from the prime vertical to the meridian, add this fourth arc to the arc of altitude at the equator; but when the azimuth is above 90°, subtract the altitude at the equator from this fourth arc; also when the latitude and declination have unlike names, subtract the said fourth arc from the arc of altitude at the equator, for the altitude at the proposed azimuth. The points corresponding to the tabular numbers, thus ascertained, must be inferred by intersection of lines drawn from A, as before, to the quadrantal arc B C, and lines uniting those points will be the lines of azimuth for each hour in every day of the year. But to complete the instruments, two sights or vanes must be fixed on the meridional line A C, and a small plumbline, with an adjustable head, must be suspended from the point A of the quadrant.

In addition to the lines already described, Gunter's quadrant has sometimes a square under the angular point A, called a quadrat, as seen in the figure, two sides of which are divided into ten equal parts each, and these again subdivided into others, the use of which is to measure angular distances; and sometimes the large square is subdivided into a number of smaller ones, for the purpose of performing arithmetical proportions by inspection. See BIOL on the Construction and principal Uses of Mathematical Instruments.

It would be tedious to enumerate all the uses of this quadrant, and to exemplify all the problems that it is capable of performing, or rather of illustrating (for great accuracy cannot be expected in the indication of so small an instrument); but we will specify a few of the most useful, which may be varied by reversing the process, and by altering the data, to a great extent.

**Problem I.** To find the Sun's Right Ascension.

Stretch the thread from the point A over the sun's place, as marked in the graduated ecliptic, and the degree cut by it in the quadrantal arc will give the corresponding right ascension.

**Problem II.** To find the Sun's Declination.

Stretch the thread as before, and slide the bead till it rests on the sun's place for the given day, and then turn it to the scale of declination, where the corresponding degree will be seen under the bead.

**Problem III.** To find the Sun's Meridian Altitude on any Day.

Extend the thread over the day of the month given, in its proper scale, till it reaches the quadrantal arc, and the sun's greatest altitude for that day will be indicated thereby.

**Problem IV.** To find the Hour of the Day.

Extend the thread over the day of the month, and, holding it there, slide the bead till it lies on the line of twelve o'clock; then elevate the quadrant so that the solar ray may pass through the upper right-hole exactly upon the second, and allow the plummet to rest, and then the bead will indicate the hour, before or after noon, as the case may be. In a similar manner the sun's altitude may be measured by the thread falling on the quadrantal arc, when the solar rays pass as above described.

**Problem V.** To find the Sun's Amplitude.

Let the bead be rectified for the given time, and be brought
brought afterwards to the horizon, while the thread remains stretched, and it will indicate the rising or setting amplitude, as the case may be.

Prob. VI.—To find the Ayscnzional Difference.

Rectify the head as in the last problem, and bring it to the horizon, in which situation the thread, extended to the quadrant, will shew the ascensional difference in degrees, which converted into time will shew how much the sun rises before fix in summer, and after fix in winter, and consequently will give the exact length of the given day.

Prob. VII.—To find the Sun’s Azimuth.

Rectify the head for the given time, and observe the sun’s altitude as explained in prob. 4. Then extend the thread to the complement of that altitude, and the bead will indicate the azimuth corresponding, and vice versa.

Prob. VIII.—To find the Hour of the Night by a Star.

Put the bead on the thread to the distance that will indicate the star’s declination, and look through the sight for the star till the plummet rests on the plane of the quadrant, and in that situation the bead will shew, in the hour lines, the star’s distance in time from the meridian of the place; in the next place subtract the sun’s right ascension in time from that of the star, as given in some catalogue, and to the remainder add the observed distance from twelve o’clock in sidereal time, and the sum will be the hour nearly, or the approximate distance of the sun from noon, which may be corrected by applying the sun’s variation of right ascension since the preceding noon, which in every six hours will be about a minute.

Sutton’s quadrant, and Collins’s facet on a quadrant, are very similar, both in construction and use, to the quadrant we have here described, and the dial on a card, by Ferguson, is nearly related to it, particularly as it has been lately improved by the Rev. W. Pearson.

Of Astronomical Quadrants.—The quadrants which we have hitherto described may be considered as by no means perfect, but as approximating only to an instrument, that is really useful in an observatory for determining the exact place of a heavenly body; hence the quadrant which we propose next to describe, has obtained the name of astronomical, from its superior pretensions to accuracy in the measurement of altitudes taken above the horizon, and therefore merits our more particular attention.

An astronomical quadrant may be either portable or fixed; in the former case it is usually mounted on a tripod, with adjusting screws in the feet, and has a horizontal motion as well as a vertical one, in order that it may take altitudes in any azimuth, or be made to follow the body observed in its apparent path; but in the latter case it is fixed against a steady wall, with its plane in, or very nearly in the meridian, and is therefore denominated a mural quadrant.

The first astronomical quadrant, of which we have any account left us, is that which Ptolemy used; it was the fourth part of a circle placed upright against a stone pier, or quadrangular log of wood, with zero of the arc in the horizontal line, and a pin of wood projecting from the central point throw a shadow on the limb when the sun shone, which shadow was used by way of index; but it is obvious that such accuracy was not to be expected from such an instrument, however well constructed or divided. We might mention here the quadrants of Tycho Brahe and Hevelings, but the former has been noticed under our article Circle, and the latter was destroyed in the conflagration of the owner’s house in Dantzie. In more recent times, astronomical quadrants have been made on accurate principles, and with great care, especially by Graham, Sisson, Bird, Rambo- den, Cary, and Troughton, several of whose instruments we will now describe, as far as any difference in their construction renders distinct accounts necessary. We will proceed, as we have done on former occasions, chiefly in the order of time, which, generally speaking, will be found to be also in the order of successive improvements.

Mural Quadrant by Graham.—Before we proceed to describe the mural quadrants, contrived and made by Graham, and fixed at the well side of the stone pillar in the middle room at the Royal Observatory at Greenwich, at the expense of King George I., and for the use of that eminent astronomer Dr. Halley, it may be proper to mention that Flamsteed, and his assistant Sharp, had previously used an arc of a circle fixed against a stone pier in the meridian, which they had themselves contrived, and which was removed at Flamsteed’s death. We must, therefore, consider their instrument as having been the prototype of Graham’s mural quadrant, or arc, as it has been also called sometimes. In fig. 4. of Plate XXIII. of Astronomical Instruments, is given a representation of the mural quadrant of Graham’s construction, which will equally represent that of Bird, contrived after the same model, and is the same that both Dr. Smith, and Stone, the editor of Eion’s work, have given in their respective accounts.

The body of this quadrant is composed chiefly of bars of iron united together, as seen in the figure; some, to form the plane of the quadrant, placed flat-ways; and others, to give strength and stability, fixed edge-ways. These bars are all of the same dimensions, namely 2.5 inches wide, and 0.175 thick, and are united together by right-angled bent bars in various places, both at the interferences made by the sides of the small squares, and at other situations, so that while great firmness is obtained, great weight is avoided. The quadrantal arc is composed of two bars, one of iron, united to the iron frame, and the other of brass, on which the divisions are made, as described under our article Graduation; this brass bar is pinned fast to the iron one, and being more slender than the iron, accommodates itself thereto, and, as time has proved, does not alter the shape of the arc, as we have lately been assured by Mr. Troughton. The breadth of the limb is 2.2 inches, the brass limb being more remote than the anterior edge of the iron arc by 1.2 inch, and the surface was planed, or rather sanded, by a tool fixed to a radial bar, that revolved on a vertical axis of motion, placed in the centre of the arc, and relling with its superior end in a fixed beam above the plane of the quadrant, when this plane was lying in a horizontal position, it being impracticable to put so large a body in any ordinary lathe. The original divisions of Graham were incised on two separate arcs, one graduated into 90° and its subdivisions, and the other divided into 90 parts and its subdivisions, as we have before explained in the article just referred to; but the divisions, being laid down by rough dividing, are not now made use of, but a quadrantal arc of 96, with its subdivisions, put in by Bird in 1753 between the two arcs of Graham, is that which all observations taken by Graham’s quadrant are now referred to, and the readings are transformed into degrees, minutes, and seconds, by an appropriate table. The readings were at first obtained by a double vernier-piece carried by the telescope, that revolves round the centre of the arc, one side of which vernier-piece read with the arc 90°, and the other with the arc of 96 parts, or grand divisions; the degree was subdivided into 12 parts, or 57 parts, and 10 parts on its vernier equalled 11 out of the said 12 parts, so that
degree, the pieces coincidence fcrcw-pin the and 01 did. That 96.85 but fere the this, and this lower the 30", brafs any and fupported the fince celebrated to the read, and this 16. Hence in the firft vernier its number 11 is one left than its equivalent arc contains on the limb of 90°; but in the second, the number 17 is one more than its equivalent arc contains in the arc of 96 parts, on which account the reading of one vernier is in the direction from right to left, but that of the other, on the contrary, from left to right; one meets, and the other overtakes the dividing strokes of the divided limb; and for the fame reafon, in the common Hadley's quadrant, or rather ochant, sometimes 19 subdivisions, and sometimes 21 on the limb, act againft 20 in the vernier, but then the readings are not in the fame direfion. The telecope is clamped to the arc in any situation by the mechanism for flow motion in the ufual way, which probably was firft adopted in one of the large quadrants, and its counterpoife beyond the centre of the arc, gives it the advantage of remaining in any position. It has crofs hairs in the focus of the eye-glas. When the lines of the vernier are none of them coincident with any one on the limb of either quadrantal arc, the portions less than what the verniers prove to indicate were exclaimed by the eye, by examining the situation of other pairs of dividing lines, to the right and left of the near to a coincidence; and to a want of a micrometrical nut to the fcrew of flow motion may be attributed the remark, that has been made, that the readings thus taken, even with fo large radii as 96.85 and 95.8 inches, were not to be depended upon to 10'. That the motion of the telecope might be quite easy, and that the centre of the quadrant might be relieved of its weight, the following contrivance was introduced: ab repreffible an iron axis laid across the top of the wall, having two brafs plates fixed perpendicularly to its ends, with notches cut in them for this aim to turn in, which axis points to the centre of the quadrant at right angles to its plane: to that end of it next to the quadrant, at a, an iron arm, e d, is fixed, having two brafs plates, e, f, d/; almost perpendicular to it; to these are riveted two flender slips of deal, whose remote ends meet at g, near the eye-piece of the telecope, and are held together by a brafs cap. Through a small plate fixed to one fide of a collar, embracing this lower end of the telecope, there paffes a fcrew-pin at 88 parallel to the telecope; which pin, being fcrewed into the cap at the end of the faid slips of deal, holds up the telecope againft the centre-work, while the slips are braced by other crofs slips of the fame light wood. The counterpoife i is supported by the rod h i at l, the retiring end of the axis a b; and a pair of brafs rollers k, l, acting againft the limb of the instrument, give freedom to the motion of the telecope thus counterpoife, and complete the construction. The quadrant being thus put together, some strong but small plates of brafs are made fast to its posterior face, and bent fo as to fall into as many hold-fails in the wall, into which they are refpectively fereved; but the weight of the whole is supported chiefly by two pins or bolts inferted into the holes A and B, made in pieces of metal attached to fuch angular points of the iron bars, as best support the centre of gravity of the whole: the pin A is made fast into the wall, but allows a motion round it, and the pin B fixes the quadrant after its extreme radii are adjusted, one horizontal, and the other vertical: this position was given by means of a plumb-line of fine silver-wire, that at firft was fo fupended as to be fice both the centre of the quadrantal arc and the point 90° on the limb, but which was transferred afterwards to an adjustable point of fufpenfion out of the centre, with a corresponding dot made on the arc of excess of the limb. The plane of the quadrant was made vertical, as compared with the plumb-line, by the fcrews of the hold-fails; and the telecope was adjusted parallel to this plane by comparison with a tranit telecope viewing together both high and low fars in fucception; but the line of collimation of the telecope could not be fixed properly, as it regarded the true horizontal line of the quadrant paffing through its zero, without the aid of Graham's factor. This factor was, therefore, fo adjusted to a far near the zenith, that it measured the fame zenith-diftance, with its plane turned to the eafit, as it did when turned to the west, and had its error atermined in this way, and afterwards an altitude, taken with the quadrant, was made to correspond with fuch corrected altitude of a far taken with the defignified factor in revered positions, which property the mural quadrant does not polifh. The method of performing this adouiment for collimation will be understood from our directions hereafter given, when treating of Ramsden's portable astronomical Quadrant.

Bird's Mural Quadrant.—After the defcription we have given of Graham's mural quadrant, we shall have no occafion to dwell long on the structure of Bird's, which was made of brafs entirely, after a fimilar model, but divided in both its arcs, of 90°, and of 96 grand parts, with more skill than Graham proved himfelf matter of in this part of his labours. Smith and Stone deferibe Graham's quadrant as fixed to the eafit fide of the pier at Greenwich, and looking to the fouth, which was the situation for taking meridian altitudes of the greateft number of fars; but fince the year 1753, it has been placed on the welf fide, looking towards the north, and Bird's then took its original place.

This quadrant, which was procured in the time of Dr. Bradley, was firft placed on the welf fide of the pier, in 1750; and the obervations of himfelf and of Dr. Malkeleyn, taken by it firft it was placed on the eafit fide, have contributed largely to complete the hefet catalogues of the heavenly bodies, which otherwise must have been very defective. While, however, Mr. Pond, the preffent astronomer royal, was engaged in making his well-known table of declinations, with one of Trughton's circles, at Weftbury, he found reafon to fupject the accuracy of the total arc of this quadrant, from a compariion of his own determinations with those previously made with Bird's quadrant; and a fubjecftent examination of the arc by Troughton justified his fupicion. With an apparatus exprifely contrived for the occafion, this celebrated mathematician and instrument-maker measured the total length of the quadrantal arc, and found it too fmall by 7", exclusive of another fimilar error of 2°, occasioned by the wear of the axis of motion; though, on a rigid trial of the intermediate divisions, he did not detect more than one fecdnd of error, or rather of inequality, among the neighbouring divisions in any part of the arc. This trial was made in the prefence of the preffent astronomer royal, in the year 1807; and the refult, while it ferves to correct pupil obervations, by the addition of 1" to every fucceffive 10° of altitude, would have tended to correct all future obervations by a like addition, had not the large tranit-circle, lately made and fixed in the fame obfervatory by Troughton, superfeded...
fuperfeded the ufe of both the quadrants by its superior accuracy. The quadrantal arc of Graham's quadrant has not lately undergone a fimilar trial; but Troughton thinks it probable that the iron instrument has preserved its figure better than the brafs one, and that confequently the addition of the brafs arc on the face of the iron one has had no undue influence in altering either its temporary or permanent dimensions. At firft, the telecope of Bird's quadrant was not braced; but after a trial, it was found to bend a little by a counterpoife of 80 pounds, and was afterwards braced by frame-work furrounding it, that prevented its yielding. A trial was made by Dr. Bradley of the total arc, in January 1753, after it had remained three years on the weft side of the pillar; and though its weight is eight hundred pounds, the error was found to be not more than two seconds. He did the fame again in July, in the year 1759, when it had remained fix years and half in its new ftuation, on the eafi side of the pillar, and found the arc exactly 90°. These examinations, having been made in the extremes of cold and heat, fhow that change of temperature did not a fect the total arc; and that, therefore, the 7" diminution of the arc, detected by Troughton, is occasioned by a change of figure in the space of 48 years. The difference of the readings of the two arcs has never yet amounted to 4", which is a fanding proof of the accuracy and flill of Bird as a divifer. Near the eye-piece of the telecope is a good micrometer, that not only gives flow motion in taking obfervations, but measures the number of seconds that the reading lines of the vernier is short of coincidence in any obfervation; and formerly the quantity indicated by the vernier had three fconds added, to obtain the whole meafure; but, by Smeaton's advice, the vernier is now disregarded, and the addeement, obtained by feveral turns of the micrometer-fcrew alone, is used to complete the fimple reading of the divisions and fud bifctions, or 5' spaces; in other words, the fcrew, and not the vernier, subdivides the laft 5' space in the obferved arc, and gives what is due to the obfervation. The adjuftlement of this instrument, which was made of eight feet radius, on purpofe to take the place of Graham's, are made in all refpects as they are made in its predecessor; and the fector, which ferves for adjufting Graham's line of collimation by fars near the zenith, is used for the fame purpofe in Bird's quadrant. If any of our readers with to feethe the original plan of all the separate parts of Bird's quadrant, and to read his decription of them, we beg leave to refer them to his quarto pamphlet, entitled "The Method of constructing Mural Quadrants," published by order of the commissioners of the Board of Longitude, in the year 1760. In this pamphlet, however, it is not mentioned that the vernier of the arc of 90° subdivides the space of 5' into ten parts of 30" each, by having ten divisions thereon, reading with eleven subdivisions of the limb; but we know that this was the original reading of the vernier.

Jeremih Siffon's Mural Arc.—Perhaps it would have been more confonant to the order of time, if we had fpoken of the younger Siffon, who was Bird's contemporary, and at one time his employer, next after Graham; but the histories of the two mural quadrants at Greenwich being connected, demanded that these instruments should follow each other in immediate succession. In the year 1768, Jeremiah Siffon, the fon of Jonathan, made the large mural arc at the king's private observatory in Richmond gardens, which extends 45°, or more, beyond a quadrant, and consequently reaches beyond the north pole; which circumstance gives it the advantage of being put in the meridian, by an obfervation of the pole-star. The divisions of this arc are into degrees and its sub-divisions, but the frokes are not cut very neatly; and the reading, as was the cafe with Bird's quadrant at firft, is performed partly by a vernier, and partly by a micrometer-fcrew. We have felectcd this instrument, as a fpecimen of Siffon's construction, principally on account of a power that it poifefles, which is very important, but which probably was not contemplated, and confequently not intended by the maker himself: the extenfion of the divided limb, to feveral degrees beyond the north pole, affords the means of using this instrument in the manner that Troughton's large mural circle is now ufed, at Greenwich Observatory, by the prefent aftronomer royal; namely, to meafure the polar distances of the fars directly from the true polar point, without any reference to the lati- tude of the observatory, which method is one of the greateft modern improvements in making aftronomical obfervations. It is much to be defired that this mural arc fhould be divi- ded again by Troughton, or fome other superior divider, and that it have micropic micrometers applied to it, which may be placed by adjuftement over any optional part of the divisions, and at any affumed distance from each other; for though it would not then, as it does not now, poifefs the valuable property of oppofite readings, and of a motion in altitude to reverse the oppofite arcs, by reafon of its being lefs than a femicircle, yet being compactly made, and of large radius, it is capable of receiving divisions fuperior to thofe on the quadrants which we have juft defcribed; and as the fitation and flructure of the observatory are excellent, the appointment of a regular observer to co-operate with the aftronomer royal would be highly conducive to the interefts of aftronomy. We hope that this hint may be taken up in a quarter where the power exifts of realizing our wishes in this refpect. Aftronomical clocks, and various other auxiliary instruments, are already in the observatory; fo that the principal expeffes of instruments, as well as of an appropriate and elegant building, is already incurred.

Portable Aftronomical Quadrant by Ramflen.—It frequently happens that fuperior artifices vary the construction of their instruments to fuit the views of the purchaser, or the fcale on which they are to be constructed. We will fealet out of the quadrants made by the late ingenious Mr. Ramflen, that which he made for Dr. Shepherd for the observatory of Chrift-college, Cambridge, and which profeffor Vince has defcribed at confiderable length in his "Treatife on Practica1 Aftronomy." The figure exhibiting this quadrant is the 5th of Plate XXIII. of Aftronomical Instruments, which requires but little explanation. The tripod on which the quadrant is mounted has fcrews of adjuftement to fix the fem, on which the horizontal motion is performed, perpendicular, which is proved to be fo in all directions when the plum-line bifects both the superior and inferior dots during the whole revolution round a horizontal circle. The visible fem is a brafs tube, and through it ascends a folid steel vertical axis, which fitting closely at the superior and inferior ends, has not the leaft shake, and pre- ferves the position once given it fo long as the feet fcrews are unmoifled. The telecope is of the achromatic conftuction, and has the ufual apparatus for flow motion, the fem of which is made a micrometer to subdivide the small reftidum of the angle that the vernier alone will not indi- cate, when the coincidence is not perfect. The telecope lies on a bar that carries the counterpoife, and in which is the centre of its motion. It has a fystem of wires in the focus of the eye-glas, which are adjuftable by fcrews, both upwards and fideways, as well as in a circular direction, fo that the adjuftlements for collimation, and for zero in the alti- tude circle, may be effected thereby. The point of fuf- pension of the plum-line is also adjuftable by a proper fem apparatus.
QUADRANT.

apparatus. At the top of the vertical tube, or stem, is a small horizontal circle with a clamping apparatus for slow horizontal motion, by means of which the whole quadrant, with its attached telecope, turns gradually round in azimuth. When observations are made in or near the zenith, the plumb-line falls in the way of the telecope, and is obliged to be removed, on which account the large quadrant made by Ramfden for the duke of Marlborough, and now placed at Blenheim, has the plumb-line suspended at the posterior face of the instrument. This inconvenience is, however, remedied by the addition of a spirit-level suspended from an adjustable horizontal brass rod, under the uppermost radial bar of the quadrant, and this level not only supplies the place of the plumb-line when taken off, but at all times serves as a check on its adjustment, and, when furnished with a graduated scale, may very well be made its substitutive.

The construction of Ramfden's portable quadrant was probably borrowed from Bird's, as well as his method of dividing the larger instruments that exceeded the reach of his dividing engine; but the instrument before us has no other horizontal or azimuth circle, except what is used plain, for the purpose of giving motion. Neither is there a second horizontal telecope fixed permanently in that situation by which the telecope of observation may have its collimation determined, and the zero of its vernier adjusted.

The vernier of this quadrant reads with two sets of divisions, like that of the mural quadrant by Bird, but the radius being small, the subdivisions are made into four parts each; the inner arc is divided into 90°; and the subdivisions into 15° each, but the outer one into 90 parts, or grand divisions, and these again each into four parts, or subdivisions; and those two arcs operate as a check on each other. The micrometer sub-divides the 15° into 30°; but it is necessary to convert the reading of the arc of 90 grand divisions into a corresponding quantity, expressed in degrees, minutes, and seconds, which may be done by direct proportion, or, which is more feasible, by a table that we have fulljioned, calculated for this purpose. The readings of the arc of 90 are put down with titles divisions, sub-divisions, and vernier, where 16 (and sometimes 32) on the vernier are equal to one sub-division, and four sub-divisions to one division; for example, suppose the reading to be thus, 21 div, 2 sub.

<table>
<thead>
<tr>
<th>Divisions</th>
<th>Sub-divisions</th>
<th>Vernier</th>
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<tr>
<td>14 3 7</td>
<td>28 7.5</td>
<td>9 40.1</td>
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When, however, the coincidence of the vernier is not perfect, the quantity brought up by the micrometer-screw must be added as a fractional portion of 52° 15', which is the value of one step of the vernier, when 16 is the number of steps, but if 32 are infected, then 26° 4 would be the value of one step forwards from zero.

A Table for the Reduction of the Grand Divisions, Sub-divisions, and Vernier, of the Arc of 90, into Degrees, Minutes, and Seconds.

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<tr>
<th>Grand Divisions</th>
<th>Sub-divisions</th>
<th>Vernier</th>
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<tr>
<td>1</td>
<td>0 56 15</td>
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<td>2</td>
<td>1 52 30</td>
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<td>32</td>
<td>30 0 0</td>
<td>32</td>
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Adjustments.
QUADRANT.

Adjustments.—1. To adjust the axis of the pendial vertical.—This adjustment may be performed either by the plum-line or by the level, both which methods we will explain in succession. We have already said that when the wire of the plum-line will continue to bisect both the upper and lower dot, while the instrument is turned quite round in azimuth, its axis is vertical in all directions, but this could not be effected unless the plum-line passing through the two dots were also parallel to the axis; this adjustment, therefore, is made partly by the screws at the feet of the tripod, and partly by the screw that moves the piece bearing the upper dot in a lateral direction. In the first place then turn the quadrant in azimuth till its plane, or, which is the same thing, the telescope lies parallel to a line joining any two of the three feet, and turn one of these two screws till the wire bisects the lower dot, and with the proper screw bring the upper dot to the same wire; then reverse the telescope by turning $180^\circ$ in azimuth, and if both dots are again bisected, the axis is vertical in the direction that the telescope has pointed; in the next place turn the telescope the space of a quadrant till it points in the same direction as the third foot of the tripod, and make the wire bisect the lower dot by the screw of this foot, and it will be found to bisect the upper dot also, if the first adjustment of the dot was properly made, but if not, repeat the operation till both dots are bisected in all the reverted situations of the telescope, and then the axis will be vertical in every direction.

In making this adjustment by the level alone, the proceeds must be thus; first, the level must be made parallel to the rod on which it hangs, and secondly, this rod must be put perfectly horizontal, and the level will then be horizontal also, with the bubble in the middle. In order to make the level parallel to the rod, place it parallel to a line joining two of the feet screws, and bring the bubble to the middle by one of the feet screws in question; then take off and revive the position of the level, and if the bubble is found in the middle now, the parallellism is perfect, if not, one half of the error must be rectified by the screw-foot-screw, and the other half by the adjusting screws at the end of the rod, by releasing one and screwed up the other. A repetition or two of these processes will make the bubble stand in the middle in both of the reverted situations. In the next place, with the level thus parallel to the rod of the instrument, turn the quadrant round its axis an entire semicircle as nearly as can be estimated, and if the bubble will now rest in the middle, the rod is level, and being at right angles with the axis of the quadrant's motion, proves that this axis is vertical in every direction; but if the bubble is found to run to one end of the tube, bring it one half way back by the rod's adjusting screws, releasing one and fixing the other, as the case may be, and the other half by the proper foot-screw. A repetition of these processes will soon settle the bubble in the middle during a whole revolution in azimuth, and then the adjustment of the axis is perfect, as well as of the rod and level.

2. The second adjustment is that by which the line of collimation of the telescope is made parallel to the horizontal line that passes from the centre of the quadrant to zero on the limb, or quadrantal arc, at the same time that zero on the vernier coincides with zero on the limb. This important adjustment may be made in several ways, some of which are tedious and otherwise objectionable; but we will confine ourselves to two which apply, one to the vertical, and the other to the horizontal line of the quadrant, which two methods, when duly effected, will not only check each other, but detect the error of the total arc, if there is any, at the same time; which is an acquisition of the utmost importance. First then, to adjust by the vertical line, let the axis of the quadrant be first made truly perpendicular in all directions by the adjustment we have already described, and fix on a star within a few degrees of the zenith, when exactly on the meridian, and measure its altitude by the crosf-wire in the field of view in the usual way, and note down the result; do the same on a successive night soon after, if possible, on an evening of similar temperature, with the quadrant turned half round in azimuth, and note again the result; if these readings prove to be at equal distances from the point $90^\circ$, one on the quadrantal arc, and the other on the arc of excess beyond $90^\circ$, the horizontal wire is truly placed in the eye-piece, but if not, half of the difference of the readings must be corrected by the proper screw for raising or lowering the said wire. This may be done by directing the telescope to a distant mark till the crosf-wire bisects it, then by moving the screw of flow motion of the vernier the half quantity required, and by bringing back (up or down) the crosf-wire thus displaced to its original mark again. This operation repeated will place the crosf-wire in such situation, that zero on the vernier will be in its proper place with respect to the point $90^\circ$; or the half difference thus ascertained may remain, without altering the crosf-wire, as an error of adjustment to be constantly applied with the sign $+$ or $-$, as the case may be, in all subsequent observations. Again, to adjust by the horizontal line passing through zero of the quadrantal arc, it will be necessary to have a second telescope turning on pivots in adjustable Y's attached to the back of the quadrant, on the same level with the said horizontal line of the quadrant. This telescope may be called the adjusting telescope, and may be also used to 'swatch' a distant mark, before and after an altitude is taken, in order to detect any deviation in the position of the vertical axis, that may happen during the operation of measuring. Let the adjusting telescope bisect a fine distant mark with its crosf-wire, and turn the tube of the telescope round one halfway on its pivots, as it lies in a horizontal position, and if the wire now bisects the same mark it is truly fixed, if not, look out for a new mark a little higher or lower, as the case may be, and make it cut that in the reverted positions of the crosf-wire, by means of the proper screw for this purpose; now this adjusting telescope will be adjusted for collimation: in the next place, put zero on the vernier to zero on the limb, and direct the telescope of observation to the same distant mark, by which the adjusting telescope had its wire adjusted, and let this mark be bisected by both telescopes, the level and plum-line at the same time shewing that the vertical axis is perpendicular; now turn the quadrant half round in azimuth, and reverse the adjusting telescope so as to view the same distant mark again, and if it is found to bisect it as before, the horizontal line of the quadrant is right, and also the quadrantal arc without error, supposing the telescope of observation to have its adjustment for collimation as fixed by the point $90^\circ$, above described; but if this adjustment of the point zero on the limb be first made, half the apparent error must be rectified by the screw at the eye-piece, by means of reversed positions and new marks; and then afterwards the adjustment by a star near the zenith will detect the error of the whole arc. If, however, no error in the total arc exists, then the adjustment for collimation may be made either from the horizontal or from the vertical measurement, as may be most convenient; one of which is more practicable by day, and the other by night. When this delicate and very essential adjustment is finally settled, the object-glass of the telescope should not be disturbed, and therefore it would be advisable to have its interior surface well cleaned previously.

It was taken for granted that the crosf-wire was perfectly horizontal.
horizontal during the time the preceding adjustment was made, or, which is the same thing, that the parallel vertical wires were perpendicular to the horizon. This is proved by simply removing the direct telescope to a fine small distant mark, and make the adjustment for vision, if necessary; then if one of the vertical wires will continue to bisect the said mark through the whole field of view while the telescope is elevated or depressed, the wires are right, but if not, they must be made so by the proper screws for that purpose, near the focus of the eye-glasses. This preparation ought to precede the last adjustment, and when once made, seldom requires altering, except in case of accidental injury.

It has also been assumed in the preceding adjustment, that the maker of the instrument placed the plane of the quadrant parallel to the axis of its motion, and also the line of collimation of the telescope parallel to the said plane. The former may be known to be true thus; if, when the plumb-line is adjusted, at its centre of suspension, just to escape touching the limb, (which should always be the case,) the quadrant's motion in azimuth will not alter it in this respect, the plane is truly fixed; but if not, the fences, that fix the quadrant to its axis, must be referred to for the alteration, which is best done by the maker. When there is no plumb-line, a small spirit-level, fixed at right angles to the plane of the quadrant, will answer the same purpose; for the raising of the bubble during the quadrant's revolution in azimuth, will be a proof that the plane to which it is at right angles is vertical. With respect to the parallel position of the telescope, as this is guided by the vernier sliding on the limb, it is the business of the maker to adjust it properly, which he will best do by a comparison with a good transit instrument of the parallels of a high and of a low star in each of the two instruments; but a small deviation of the telescope with respect to parallelism, though to be avoided if practicable, will not sensibly affect the measurement of altitudes, which is the sole business of this instrument. If, however, this deviation is considerable, the eye-end of the telescope must be set nearer to or farther from the limb, as the case may be, by the maker himself. We have been the more minute in describing these adjustments, not only because they are indispensably necessary in making good observations, but because they will apply, one or other of them, by means of the plumb-line, or of the spirit-level, to all other astronomical quadrants that have a motion in azimuth.

We have before us the drawing of a large and beautiful quadrant made by Mr. Cary, for Leopold, the late grand duke of Tuscany, with two telescopes and a graduated azimuth circle, but the description we have given of Ramfden's instrument will equally apply to his, except as to the dimensions.

Portable Astronomical Quadrant by Troughton.—Though we have described Ramfden's portable astronomical quadrant with much minuteness, and have detailed the most useful methods of making such adjustments as will apply to the other portable quadrants that have a motion in azimuth, yet we should do violence to our own feelings, as well as to the ingenuity of an excelling artist of the first eminence, if we withheld from the public eye the great improvements that he has made in this instrument since the death of Ramfden. Fig. 6, of the same plate that contains Ramfden's instrument, is a reduced perspective view of the improved astronomical quadrant of Troughton, which was made by him and sent to Bilboa in Spain, about the time that astronomical circles began to be constructed. It has been ascertained, under our article Circles, that this instrument, as constructed by Troughton, (and we may now add, by Thomas Jones, who has learnt his mode of dividing,) is greatly superior to any quadrant that can be made, on account of properties which the circle exclusively possesses; but so far as a quadrant's accuracy can be depended on, Troughton's improved construction is to be preferred to all others. And, indeed, when we consider that simplicity, fleetness of performance, and permanence of the adjustments once made in this instrument, are properties which it peculiarly possesses, along with comparative cheapness, it is probable that there will always be purchasers, when such an instrument is on sale, provided the improver will content to make such instrument with limited powers, when he can have rapid sale for those which he now constructs, with all the advantages that the circle affords.

The radius of this quadrant is three feet, and the body is made double, that is, of two quadrantal frames united into one, by small pillars holding their planes parallel, and enfuring the two properties, not often united in other men's instruments, of lightness and strength at the same time. The tripod, on which the quadrant is supported, is a frame of mahogany, braced in different directions, so as to resist any ordinary preflure; when the quadrant is put in motion, or the telescope used. The three feet-crews are furnished with each a Hooke's joint and long handle, so that the observer may make an adjustment with any of these screws without flopping, and consequently without withdrawing his attention from the plumb-line apparatus, or spirit-level, that indicate the quantity of adjustment that may be necessary from any individual screw. About the middle of the pedestal, or frame-work of the tripod, is a three-armed horizontal bracing piece, on which the item of the quadrant rests; and this item is kept vertical by a socket of brass made fast to the centre of the table, that surmounts the pedestal, in which socket the vertical axis turns both steadily and freely, while it rests on the three-armed bracing piece below. The azimuth or horizontal circle is centered on this axis, but so as to admit of a motion round it of about two degrees, for the purpose of putting the zero of the quadrant right when the telescope is in the plane of the meridian. This small motion is produced by the tangent screw seen in front, and the other tangent screw regulates the flow motion of the telescope and vernier, by taking hold of the solid vernier plate, that reads at opposite points, and that may be clamped, when in use, to the azimuth circle, which is also a solid circular plate of brass, subdivided into 10° spaces, and reading by the verniers alone to 10'.

The vernier or index-plate is of considerable depth, and hollow, terminating with a chamfered edge below, and contains in it a triangular frame not seen, foleder to it, and opposed, for the sake of strength, by another similar frame seen above its plane. From the frame within the hollow index-plate arise three small pillars, which support the upper triangular frame at the three corners, and palling through it receive so many milled nuts on their tapped ends, by which means the whole are compactly united. These milled nuts are useful for adjusting the plane of the quadrant parallel to the vertical axis of the quadrant's motion in azimuth; and it is here where the quadrant is to be secured from the wind for close package. Upon the upper triangular frame is folded fast a short but strong conical tube, that supports the long column that terminates with a supplementary cone. From nearly the lower extremity of this long column a couple of braces ascend about twenty inches to the upper part of the body of the quadrant, and, by being made fast to it, complete the adjustments of the structure in an admirable manner. The telescope, which is about forty-two inches long, and achromatic, as well as furnished with an adjustable fly-wheel of Spider's threads, tapers from the object-glasses down-
downwards, to prevent any inclination to bending by its weight, and has an axis of motion of four inches and a half long, that passes through the thick pillar, that connects the two quadrantal portions of the double frame at the exact centre of motion, and of the divided arc. The counterpoise is applied at the redundant end of the telescope, and the vernier borne by its end, near the eye-piece, divides the 5 spaces of the vertical arc into 50, while a micrometrical microscope, attached to the metal of the telescope, subdivides this half quantity into single seconds. A nicely ground spirit-level hangs on the horizontal bar, with its proper adjustment apparatus, which alone will ascertain the position of the quadrant to a second; but, as if this were not sufficient, a plumb-line is made to descend, free from dail, or agitation by the wind, from an adjustable point of suspension through the hollow column, where there is little or no disturbance from a motion in azimuth, and ensures the position still more certainly. The water vessel in which the plummet is immersed, to prevent vibration, is contained in the hollow short cone before described, as containing a triangular frame within it, and the situation of the wire is examined in two directions, at right angles to each other, by microscopes looking across the bore of the column, at a convenient height for the observer to see without a change of position of his body, when he has been just observing at the telescope. The mark used for each wire to designate a luminous face, known by the name of Ramfisk’s glass, from its being only the image of a luminous point without substance, occasioned by a contracted aperture of a tube, fixed at the remote side of the column into which light enters, and by which it is directed without parallax. Besides these appendages, there is a secondary or adjusting telescope, such as the elder Sillons made for his spirit-level, and such as we have already described, as furnishing the means of adjusting the horizontal line of a quadrant that moves in azimuth, and of ascertaining the error of the whole quadrantal arc, by comparison with the adjustment by a flat near the zenith. (See Portable Astronomical Quadrant by Ramfisken, before described.) Lastly, the radial bars that bear the quadrantal arc, taper downwards from the centre, thereby giving strength to the part most liable to alter its figure by weight, as it is supposed Bird’s mural quadrant has done in a small degree for want of such precaution. This quadrant has an arc of excess at each end, and is capable of all the adjustments we have above described in an exquisit degree.

Of Nautical Quadrants, measuring by Reflection.

Sir Isaac Newton’s reflecting Quadrant.—A manuscript account of a quadrant, measuring altitudes and distances by reflection, of the hand-writing of Sir Isaac Newton, was found among the papers of Dr. Halley after his death, which quadrant, according to Stone, was actually made in the year 1672, when Dr. Halley was preparing to go to the South seas, to make an addition to his catalogue of fixed stars; but the manuscript account was not produced, or even mentioned, when Halley’s instrument was shewn to the Royal Society, nor was made known till the year 1742. (See Phil. Trans. N. S. 465.) Hence some doubt has been entertained whether Sir Isaac Newton or Halley was the first inventor of the reflecting quadrant. The most probable inference is, that each invented his own, seeing that though the principle is the same in both constructions, yet the mode of applying it is different, as will be seen from a comparison of the figures, and from our description of each in succession.

Sir Isaac Newton’s quadrant was preferred for several years at the house of Mr. Heath, who was a mathematical instrument maker in the Strand, London, and it is probably in existence at this time. Dr. Hooke is also laid, by Dr. Pratt, to have invented a quadrant that was, or might be, used at sea with one reflection only; and, indeed, he is asserted to have been the first man who proposed the use of a mirror in a nautical instrument. See Circle.

Sir Isaac Newton’s quadrant, represented by fig. 7 of Plate I. of Astronomical Instruments, consists of an entire sectoral plate of brass, PQR S, to the plane of which the telescope A B is fixed and lies parallel, and an index, which is moveable about an axis of motion at A. The limb D Q was accurately divided into half degrees, and, as is laid, half minutes, on a scale of four feet radius, and was subdivided by a diagonal scale into 1/40th of a minute. The principle on which this semi-division is founded is this; viz.

"If a fixed ray of light be reflected at a plane reflector, and if the reflector be made to revolve about an axis perpendicular to the plane passing through the incident and reflected rays, which may be called the plane of reflection, the angular velocity of the reflected ray will be double to the angular velocity of the reflector." See Vince’s Practical Astronomy, p. 7, &c.

Hence one small mirror, G, is made fast to the plane of the sectoral plate, and perpendicular thereto, but inclined in an angle of 45° to the axis, or length of the telescope, and in such a way, as to cover one half of the aperture, while another similar mirror is borne by the index, in such a position, that when the index is at zero, both the mirrors are not only perpendicular to the plane of the quadrant, or rather octant, but are parallel to each other. Now, according to the principle that we have just mentioned, when the index is moved forward, a ray of light from any fixed luminous body, when caught by the index mirror, will be reflected on the fixed mirror, and an eye directed through the fixed telescope towards the said body, will see it divide into two bodies the instant that the index begins to move; that is, the body itself will be seen stationary through one half of the telescope’s aperture, and its image will be seen in the other half in motion, and this motion has double the velocity that the index has, which bears the revolving reflector; and on this account it is, that the divisions for half degrees and half minutes, are read as whole degrees and whole minutes, as well as the 1/40th read as 1/80th by the diagonal scale. From this short explanation of the principle and structure of Sir Isaac Newton’s reflecting quadrant, it is easy to perceive that the construction is derived immediately from the principle in the simplest, though in practice not the best manner; for the instrument itself illustrates the principle in the most obvious way; but, from its magnitude and mode of being used, it is very inconvenient to be supported without a stand, which on board a ship is inadmissible.

Perhaps it might be on this account that Dr. Halley did not pay more attention to it than he appears to have done, according to the information that we at this distance of time possess. However, it is evident, that the instrument before us is capable of measuring either vertical, horizontal, or oblique angles, in the way it professes.

Cole’s Quadrant by single Reflection.—Fig. 2. of Plate XXIII. of Astronomical Instruments, is the figure of an instrument, which, like Dr. Hooke’s contrivance, measured altitudes by single reflection, as we conceive, the drawing having fallen into our hands without the description. An arc is composed of an entire quadrant, and an index with a single mirror fixed to it at its centre of motion, constitute its leading features, while a light-vane, at the remote end of the prolonged index, instead of a telescope, has a plane hole, through which the sun is viewed after reflection from the index-glass, his rays having first passed through a coloured glass.
QUADRANT.

glafs. This contruction, with the addition of ir Isaac Newton’s second mirror, would constitute an union of two instruments, that would greatly resembfe the combination adopted by Mr. Hadley, which follows next in our list of quadrants; but which may not have been copied from such union; for Cole has got the vernier scale, which is preferable to the diagonal one adopted by Hadley, and therefore probably he followed Hadley, though the quadrant before us, has not recommended itself to general use, as being an improvement.

Hadley’s Quadrant.—As we cannot help considering Hadley’s quadrant, or more properly octant, as a near relative at least to his friend ir Isaac Newton’s, we will describe it next in order, while the principle of its construction is freth in the reader’s memory. The circumstance of Mr. Hadley’s being president of the Royal Society was favourable to the early notice of his instrument; and the interest that the British nation took, and must ever take, from its infular situation, in nautical improvements, contributed to its early adoption, at a time when such an instrument was greatly wanted.

Mr. Hadley, we learn, tried various modifications in the construction, but that which has been approved from long usage is the one we shall select for description. Fig. 1. in Plate XXIII. of Astronomical Instruments, is the representa­tion of Hadley’s octant, as it is now constructed with a vernier, which it had not at first, and which is preferable to the diagonal divisions at first applied by Hadley, as well as by ir Isaac Newton. For the sake of lightness, united with strength, the frame of the instrument, when made of any of the hard woods, is put together usually as is represented in the figure, but when made all in brafs, and particularly when the limb is extended to 120 half degrees, reading as 120°, in which case it is called a sextant, the best modern makers make it double; that is, have two separate light frames, united by short pillars, flanding at right angles to their planes, which thus become parallel. This construction, we believe, was introduced by Mr. Troughton, and allows a more steady motion to all the moveable and adjustable parts, by lengthening their axes of motion, which penetrate acrofs both parts of the double frame, and by that contrivance have longer bearings. But we are now pro­posing to describe a quadrant of Hadley’s own contruction. A B C is a frame of some hard wood, such as ebony, which may be of any convenient radius, from eighteen inches downwards to three, or less, if required for the pocket, and A D is the index bearing the vernier at D, together with the usual clamping apparatus for flow motion, in making the contact in any observation. This apparatus, together with the powers of the vernier, and mode of using it, have been explained under our article: CIRCLE, (see also VERNIER,) and therefore may be referred to by the reader unaquainted with their uses. When the radius is very small, the vernier subdivides half degrees, and has thirty divisions on it, but has twenty or fifteen, accordingly as the degree of the limb is subdivided into thirds or fourths of a degree. The peculiar excellence of this instrument, either in the form of an octant or sextant, is, that all sorts of angles can be measured with it on board a ship, even while the ship is tossed by the waves; and also, that it requires no other auxiliary means, than the natural horizon, which at sea is always, or moftly present, when a heavenly body can be seen. The plummet-line and spirit-level are equally depended on; to which may be added, that, if any accidental injury be received, a circumstance not improbable in the hands of sailors, the adjustments are to finiple, that, generally speaking, the derangements may be easily rectified. In the best instruments, a small telescope is screwed into the fright-vane, which not only prevents parallax, by limiting the line of fight between two parallel wires, but affifts the sight greatly in obtaining exact contacts. There is usually an arc of excess at each end of the limb, one of which is useful in adjufting the index-error by the fun or moon, and the other is serviceable when angular diftances are measured beyond a quadrantal arc; indeed it would be well if the arc were always extended to measure 120°; or more, for then a sextant would be competent to measure all sorts of angles that the mariner can require, to find his latitude, time, and longitude.

When the octant has not the tangent screw of flow motion for adjustment in making the contact, the index is nicely moved by hand, and then fixed by a screw behind it for this purpose, and in either cafe the examination and noting down of the altitude, or horizontal angle taken, may be read at any time, for hours afterwards, which is another important advantage that this instrument possfies in common with the sextant; for where more obervers than two are not preffent, one oberver may thus manage to take both an altitude and a distance in a lunar observation with two separate instruments in quick succession, while another oberver is taking the altitude of the second object; or with the help of Margett’s horary tables, the second altitude may be had by inspection, when the hour, latitude, and declination of the body are known, in which cafe one oberver can take a lunar observation with tolerable accuracy. The limb of the instrument is best of metal, such as brafs, silver, or platina, when made and divided in the bralz way by a superior dividing engine, such as Troughton’s; but in ordinary instruments a piece of ivory is frequently let into the wood, and sometimes the divisions are made even on the wood itself, which is liable to be affected by moisture. The index is most frequently entirely of brafs, and wider as it ascends to the centre of motion, to prevent lateral bending, which would destroy the accuracy of the readings. When an observation is made by the larger fort, the right hand should be applied to the lower extremity of the index to give it steady motion, while the left holds the lower end of the remote radial bar; and the plane of the instrument must be kept in the line that joins the two objects, of which the horizon is one, when an altitude is taken, and then the instrument is held vertical. In bringing down the image of an object to the horizon by a fore observation, the body of the oberver must gradually incline towards the horizon, and a little vibrating motion will assist in determin­ing the exact plane of contact; but in taking a ho­rizontal angle, the oberver will handle the instrument as befits his convenience. The mirror at A is placed over the centre of motion of the index, in a direction pointing to zero on the vernier, and perpendicular to the flat face of the index; this index-glas, being completely silvered, reflects the light it receives directly at right angles on the glas E, when the zero of the vernier is at the zero of the limb; but as the limb proceeds forwards, this angle alters, and, as we have said, is double of the measure of the real angle to be measured and indicated. This glas E is also fixed perpendicular, and has screws of adjufment for perpendicularity above its socket of brafs, and a tail-piece with a fixing-screw behind the frame, for fixing the parallelism; the want of which is called the index-error: one half only of this glas, which is called the fore-horizon glas, is silvered, and the other half remains unsilvered, in order that both the direct rays transmitted through the unsilvered part, and the reflected rays coming from the silvered part, may meet at the eye, on which account the middle of this glas, where the line of separation crosses, is the part to be viewed
viewed in making a contact, otherwise both the image of one object, and the substance of the other, could not be seen at the same instant. F is the sight-vane, with two holes, usually an upper and a lower, inserted into the first radial bar of the frame, so that the holes are at the same distance from the plane of the instrument as the line of separation in the half-merced glass E, to prevent parallelism of the reflected rays, and in the belt instrument this vane, with its telescope, has an adjustable motion to and from the plane, in order that more or less light may fall on either of the bodies observed, which is not only useful, but necessary, in taking a lunar distance; for by this adjustment the image of one body may be made as luminous as the real body of the other, by increasing the light of one, while it decreases that of the other; that is, by making more of the covered, or of the unmerced part of glas E, fall before the object-glas of the small telescope, when this adjustment is necessary. It may be necessary to observe here, that every merced glass of sensible thickness has two refractions, one on the anterior, and the other, which is the principal one, on the posterior or merced face, and in many cases errors may be occasioned by these double refractions; to remedy which, Dr. Makleyne proposed, that the merced portion of the posterior face should be ground rough and painted black, taking care that the grinding be so performed, that the line of separation between the polished and unpolished parts be parallel to the plane of the octant. In the back merced-glas, which is that seen with its sight-vane at G, with adjustments similar to those of the fore merced-glas E, the whole posterior face is merced, except a slit, that divides it in a line parallel to the plane of the frame, through which slit the body is observed in a back observation. But when the sun is the body observed, his light is generally too intense for the eye to bear, particularly when the small telescope is used; to render the rays tolerable to the eye, a coloured glas, or glases, must be interposed, and a blank tube instead of a telescope be used, by which means the sun may be viewed without doing injury to the eye; and usually a system of coloured glases are slipped into a square hole, as at H, and a joint in each allows them, or any one of them, to be brought forwards into the situation where the direct rays must pass to the eye. The same remedy is also sometimes applied at the eye-piece of the blank tube, when the sun alone is observed. The plane of the back merced-glas is placed not only parallel to the plane of the frame, but at right angles to the plane of the fore merced-glas, in order that the frame readings may apply in both kinds of observation, and this object was effected by the maker by the simple rectangular position of the two merced glasses to each other, and by reversing the position of the body in making a back observation; for as the inclination of the index-glas to the fore merced-glas gives double the angle directly measured; so twice the complement of this inclination to the back merced-glas gives the same quantity, and on the same part of the graduated limb, when measured in a reversed position.

Adjustments.—The adjustments of every instrument are of the utmost importance to the accuracy of observations taken thereby, but they are particularly so in the instrument before us, because a small deviation from parallelism in the fore merced-glas, or from perpendicularity in the back merced-glas, as compared with the index-glas, (with the vernier at zero of the limb,) will double the error occasioned by it in the quiescent situation, as soon as motion is given to the index-glas. 1. The first adjustment is, to set the index-glas perpendicular to the plane of the instrument: this is done by first sliding the index to about 40° or 45° of the limb, while the octant is held with its plane nearly parallel to the horizon, then a glance into the index-glas will shew, whether the sharp edge of the limb seen by reflection, is an exact and straight continuation of the same edge of the limb seen by direct vision, and if this is not the case, it must be made fo by the screws that adjust the bed of the mirror; and in all cases where two screws are to be used, one must be released as much as the other is screwed inwards. Dr. Mackay proposes to place two small pieces of metal as adjusting tools, with each a horizontal line drawn on it, at equal heights from the plane of the limb, at some distance from each other, so that the horizontal line of one may be a continuation of the horizontal line of the other, when one is viewed by reflection, and the other by direct vision, but the sharp edge of the inner part of the limb will answer all ordinary purposes. 2. The second adjustment is, to set the fore merced-glas perpendicular to the plane of the instrument: this is done by first fixing the zero of the vernier at zero on the limb, and while the plane of the frame is held parallel to the horizon, by applying the eye to the lower hole of its sight-vane; then if the horizon, or any distant horizontal line, appear to be a straight line, the glas is placed perpendicular already; but if the parts seen by reflection and by direct vision do not constitute a straight line, they must be made to do so by the screws at the back of the glas, one or other of which must be screwed in or out, as the fracture of the line demands; that is, if the line seen by reflection appear above that seen by direct vision, that screw must be urged indeads, which is on the other glas, and vice verfa, until the fractured line be straight. 3. The third adjustment is, to rectify for the index-error of the fore merced-glas, or to place it parallel to the index-glas, when the zero of the vernier is placed at zero on the limb. To do this properly, a bright distant object must be chosen, such as the sun, moon, or star, and while the zero coincides, look through the vane, or telescope, and observe if the body and its image coincide; that is, if the image is invisible: in this case, the fore merced-glas is parallel to the index-glas, or is truly adjusted; but if not, release the tail-piece or lever behind this merced-glas, and with the thumb-piece give it a small motion, till the body and its image coincide, in which situation it must be fixed by the fixing nut before released. Sometimes the act of screwing will displace, in some degree, the tail-piece, and thereby again occasion a sensible index-error. When this cannot be completely avoided, the error must be ascertained and allowed for with its sign + or − in every subseuent observation, while it remains unaltered. This error may be ascertained by measuring the diameter of the sun, first forwards on the limb, and then backwards on the arc of excess, and one half of the difference of the measures will be the index-error + or −, as the case may be. 4. The fourth adjustment is, to set the back merced-glas perpendicular to the plane of the instrument: this adjustment is similar to the second, and may be performed by the directions there given, supposing them to be for the back merced-glas, and its vane, instead of the fore merced-glas. 5. The fifth and last adjustment is, to set the back merced-glas perpendicular to the plane of the index-glas produced, the zero of the vernier being placed at zero on the limb: this adjustment at sea is performed thus: let the vernier be put as much to the right of zero, as is equal to twice the dip of the horizon, in the situation where the observer stands, then hold the quadrant in a vertical position, and apply the eye to the back horizon vane: now, if the horizon seen by reflection happen to coincide with that seen by direct vision, the glas is already right; but if not, the lever or tail-piece behind the frame at this place must be released by the proper fixing screw,
ferow, and turned slowly by the thumb-ferow or nut, till
this coincidence is perfect, and then the lever must be made
fast again; the reflected horizon will be inverted when
viewed in the manner here described. When the instrument
is used in a back observation on the land, which is not likely
to happen often, the adjutment will require some artificial
aid; by Dollond’s method, an index is applied to the back
horizon-glares, by which it may be put parallel to the fore
horizon-glares, by the third adjutment applied thereto, and
then, by a graduated arc of 90°, inserted on purpose, the
index of the back horizon-glares is set perpendicular to its
former situation, and consequently is made perpendicular
to the plane of the fore horizon-glares. By Mr. Blair’s
method, the under edge of the index-glares is ground and
polished, so as to be at right angles to the plane of the
glares, and hence the back horizon-glares is adjusted, by
making the direct and reflected horizons agree, while the
vernier stands at zero on the limb, exactly as is done in the
third adjutment. But we are to suppose the instrument
not furnished with either of the above named auxiliary
means; when this is the case, a long level space must be
chosen in some common or park, where three staves can be
put up in the same straight line exactly, and at an interval
from each other of not less than 500 yards, but if 600 or
700 the better; then, the vernier being truly placed at
zero, let the plane of the octant be held horizontally with
its back horizon-glares exactly on the top of the middle
staff, and let one of the rods be viewed directly through
the back right-vane, then if the other rod, seen by reflec-
tion, coincide with it, the position of the back horizon-
glares is true, but if not, it must be made so, by the tail-
piece behind, as before directed; if in fixing the tail-
piece a derangement should take place, which cannot be exactly
done away by a second or third trial, then the index-error
for the back observation must be ascertained.

This error may be obtained by reverred observations by
two methods; thus, let the coincidence of the two extreme
staves be made from the middle staff as just directed, by
a motion of the vernier, instead of the tail-piece of the back
horizon-glares, and read the quantity moved forwards or
backwards; then turn the downward face of the frame up-
wards, and repeat the operation, and read again; now, if
these two readings are found to be one on the limb, and the
other on the arc of excess, half of their difference will be
the error found, + or --; but if they both are read on
the same side of zero, half their sum, + or -- will be the
error; when they are both read on the limb, or if the greater
quantity be read on the limb, when the less is on the arc of
excess, the sign will be --, and vice veza. By the second
method, instead of revering the plane of the instrument,
let the observer rever his position, making the right-hand
staff to be the left-hand one, and vice veza, and then let
him repeat his first observation, with the same face of his
instrument up that he had in that, and the same refult will
follow, that was obtained by revering the plane of the in-
strument. These two modes of obtaining the error in
question, by reverred observations, may be made to check
each other, and will then give an average of the two results,
for the error to be applied to each subsequent observation,
taken with the back horizon-glares in its last determined
position.

Examination of the Instrument.—These several adjutments
being finished, the observer might proceed to make his
observations, provided he could rely on the skill and credit
of the maker of his instrument; but if not, he would act
prudently to examine the materials of which it is composed,
before he relies on its performance, and allo to put to same
test the accuracy of the divisions on the vernier and limb,
as well as the care that has been taken in selecting glases
of uniform thicknes, and of good polishi. The exactnes
of the total arc may be ascertained from comparison with
measurements taken with a circle, or some well-known su-
perior instrument; or by careful trigonometrical measurement
on some level and extensive ground, where the sides of the
triangle can be accurately measured, for which purpose
Troughton’s new chain of five-foot links is admirably cal-
culated; but the intermediate divisions must be examined
on the vernier itself, by flepping the arc with it; and if all
parts of the arc are found alike divided, when examined by
the coincidence of the extreme strokes of the vernier, the
intermediate strokes of the vernier itself may likel be ex-
amined by the strokes on the limb taken in various places.
Dr. Mackay recommends a table of corrections to be made,
in case of errors being detected in the dividing, but we
should rather recommend new divisions from a good engine,
the inverting of which can now be performed at a trifling
expenee. When the planes of the mirrors are examined,
try if a candle reflected appears in two images; if it does,
the two faces of the glases are not parallel, and consequently
the glases is not fit for its purpose.

To try whether the surfaces of the mirrors be perfect
planes, bring two distinct dilatant objects into good con-
tact, and let them be seen at the upper edge of the silvered
part; then move the instrument in its own plane, and move
the image and body along the line of separation or edge of
the silvered part, and if the coincidence is not disturbed
the plane is perfect, but not otherwise. Also, when an obser-
vation is taken of the fun, and the vernier has been fixed by
the fixing ferow, read the altitude, as the dark glases, or
glases, may have been used; then remove them from the
socket that holds them, and rever their planes, by putting
their remote faces nearer; and if, after this change, the
same altitude is given, the planes are parallel, otherwise half
the difference must be applied, in all such cases, as an error
of the coloured glases. This examination is best made exactly
at noon, when the sun’s altitude is not sensibly changed dur-
ing the examination; unless a good chronometer or regula-
tor, duly regulated, and put to exact time, be at hand;
for, then the successive examinations may take place at equal
distances from noon. Or the same thing may be done by
means of a luminous object placed at a distance, and so
elevated, that an artificial horizon may give its double altitude
before and after the coloured glases are revered in position.
The best artificial horizons are either a vellum of pure mer-
cury, with a roof of good glases framed over it to prevent ag-
itation by the wind; or otherwise a piece of black glases, well
polished, and placed on scres of adjutment, with a good
spirit-level in a glases tube, so ground, that it will revvere in
position, and will place the glases in a perfect level in the
two requisite directions, at right angles to each other.

It may be proper to examine further if the two holes in
the right-vane are so made that the fun or other luminous
body dazzles the eye more in looking through one, than in
looking through the other, the intention being that one shall
take in more of the silvered part, and the other more of the
unsilvered part of the glases, so as to accommodate the quant-
y of direct light to the strength of the eye.

Illustration of the Use.—When Hadley’s octant, or sextant,
is used for altitudes at sea, the fun, moon, or star, as the
case may be, must be viewed in the way that the eye can best
bear, with or without the dark glases, telescope, &c. as
occasion may require, and as experience will dictate; and in
a fore observation the body observed must have its image
brought gradually down, so as to be in exact contact with
the
the horizon: if the sun or moon be observed, either the upper
or lower limb must be substituted for the centre, and
the observation must be afterwards reduced to the centre, by
applying the semi-diameter, + or −, from the proper column
for the given day, as given in the Nautical Almanac, or Ephe-
meris; in doing this, the face of the observer must be turned
towards the object whose altitude is to be measured, and
while the index is gradually moved forward along the limb,
the image will defend till it approaches the horizon; in
this situation, care must be taken that the contact of the
image be made with the visible horizon at the line of separa-
tion, between the silvered and unsilvered parts of the fore
horizon-glass, that both objects may be visible together;
and also that the index may not be pulled too far, so as to
require a retrograde motion in finifhing the contact: there-
fore fix the clamping piece, if there is a tangent screw, and
complete the contact by a flow motion, and the altitude will
remain unaltered till the vernier has been examined by a
magnifying glass, which ought always to be at hand, to affix
the eye in examining the coincidence of some one line of the
vernier with some line of the limb; or, when there is not an
exact coincidence, in estimating the quantity that is beyond
coincidence, as compared with the contiguous quantity that
is short of it. To succeed well in perfecting a fore observa-
tion taken at the horizon, the observer must learn to give a
vibratory flow motion of his body to the right and left, his
heel being the centre of motion, that the image observed may
be made to move backwards and forwards in the arc of a
circle, of which the horizon is a tangent, in order that the
altitude may not be taken at one fide of the tangential point,
and consequently be too great. Care must also be taken
that the faint secondary image reflected from the posteri-
or face be not mistaken for the primary image, reflected
from the proper, or anterior face of the mirror. When the alti-
itude is marked down, as read on the limb and vernier, the
corrections must be applied, for either the sun or moon, for
parallax, refraction, dip of the horizon, and semi-diameter,
before the true altitude of the centre is obtained; but for a
star no parallax is wanted, nor yet allowance for semi-
diameter; these apparently diminutive bodies being situated
at such an immense distance from the earth, as to subtend no
feasible angle, nor to have any perceptible parallax in
altitude.

It is from meridian altitudes thus taken, that, by the ap-
lication of a heavenly body's declination, + or −, as the
body may be below or above the equator, the co-latitude,
and consequently the latitude, is readily determined; and also,
the latitude being known, from an altitude taken towards the
east or west, that the time is determined at one obser-
vation, but more accurately by a series of equal altitudes
taken at opposite sides of the meridian; the reduction, how-
ever, for the sun's change of declination during the interval,
must, in this case, be taken from tables of correction for
equal altitudes, such as are contained in the pamphlet of the
late Mr. Wales.

In making the back observation, the coloured glass, or
glasses, must be selected, as before, to fuit the eye, and
the plane of the instrument held vertically, as in the fore ob-
ervation, but the face of the observer must view the point of
the horizon opposite the sun, or that pointed to by his own
shadow; first, let the eye be directed through the vane of
the back horizon-glass to the transparent slit that divides the
mirror, and let it view the horizon, then move the index till
the image of the sun is just seen on the silvered part of the
glass; a vibratory motion given to the ocele from the
to the centre of motion, will make the sun's image move
in a curve of which the convex part appears uppermost; in

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Mr. Wales, in captain Cook's Voyage, applied it to measuring the quantity eclipsed in an eclipse of the sun; in which operation it answers the purpose of a micrometer, to a great degree of certainty. See an account of the improvements suggested in the construction of these instruments, and also of the various uses to which they may be applied, in Magellans's Description des Oéants & Sextants Anglais, &c. 4°.

Other quadrants have been contrived since, by some ingenious artists, all of which have their merit; but the particulars of their construction are too many for this place; and perhaps, on the whole, nothing preferable to Mr. Hadley's invention has yet been found.

Quadrant, Herodotical, is a pretty commodious instrument; thus called from its use in telling the hour of the day.

Its construction is so simple and easy, and its application so ready, that we shall describe both, for the use of some who may want other conveniences.

Quadrant, Conduction and Use of the Herodotical. From the centre of the quadrant, C, (Plate XIX. Almanac, fig. 8.) whole limb A B is divided into 90°, describe seven concentric circles at intervals, at pleasure; and to these add the signs of the zodiac in the order they are represented in the scheme.

2. Applying a ruler to the centre C, and the limb A B, mark upon the severer parallels the degrees corresponding to the altitude of the sun when therein, for the given hours; connect the points belonging to the same hour with a curve line, to which add the number of the hour. To the radius C A fit a couple of lights, and to the centre of the quadrant C, tie a thread with a plummet; and, upon a thread, a bead to slide.

If, now, the bead be brought to the parallel in which the sun is, and the quadrant be directed to the sun till a visual ray pass through the lights, the bead will show the hour.

For the plummet, in this situation, cuts all the parallels in the degrees corresponding to the sun's altitude. Since, then, the bead is in the parallel which the sun then describes, and through the degrees of altitude to which the sun is elevated every hour there pass hour-lines, the bead must show the present hour. Some persons, who are not very nice, represent the hour-lines by arcs of circles, or even by straight lines; and that without any sensible error.

Quadrant, Sinical, is an instrument of use in navigation. It is represented Plate II. Navigation, fig. 4, and consists of several concentric quadrant arcs, divided into eight equal parts by radii, with parallel right lines crossing each other at right angles.

Now any of the arcs, e. gr. B C, may be accounted a quadrant, of any of the great circles of the sphere, chiefly of the horizon and meridian: if, then, B C be taken for a quadrant, e. gr. of the horizon, either of the sides, e. gr. A B, may represent the meridian; and the other, A C, will represent a parallel, or line of east and west; and all the other lines parallel to A B will also be meridians; and all those parallel to A C will be east and west parallels, or east and west lines.

Again, the eight spaces into which the arcs are divided by the radii, represent the eight points of the compass in a quarter of the horizon; each containing 11° 15'.

The arc B C is likewise divided into 90°, and each degree is subdivided into 12', diagonalwise.

To the centre is fixed a thread, as A L; which being laid over any degree of the quadrant, serves to divide the horizon.

If the final quadrant be taken for a fourth part of the meridian, one side thereof, A B, may be taken for the common radius of the meridian and the equator; and then the other, A C, will be half the axis of the world. The degrees of the circumference, B C, will represent degrees of latitude, and the parallels to the side A B, affinmed from every point of latitude to the axis A C, will be radii of the parallels of latitude, as likewise the fine-complements of those latitudes.

Suppose, then, it be required to find the degrees of longitude contained in 83 of the lesser leages, in the parallel of 48°. Lay the thread over 48° of latitude, on the circumference, and count thence the 83 leagues, on A B, beginning at A; these will terminate at H, allowing every small interval four leagues, and the interval between the broad lines twenty leagues. Then tracing out the parallel H G, from the point H to the thread; the part A G of the thread shews that 125 greater, or equinoctial leagues, make 6° 15', allowing twenty leagues to a degree, and three minutes for one league; and therefore that 83 lesser leagues A H, which make the difference of longitude of the course, and are equal to the radius of the parallel G I, make 6° 15' of the said parallel.

If the ship fall on an oblique course, such course, besides the north and south greater leagues, gives lesser leagues easterly and westley; to be reduced to degrees of longitude of the equator. But these leagues being made neither on the parallel of departure, nor on that of arrival, but in all the intermediate ones, we must find a mean proportional parallel between them.

To find this, we have on the instrument a scale of crofs latitudes. Suppose, then, it was required to find a mean parallel between the parallels of 40° and 60°. With your compasses take the middle between the 40th and 60th degree on the scale; this middle point will terminate again to the 51st degree, which is the mean parallel required.

Quadrant, Use of the Sinical. There are formed triangles upon this instrument similar to those made by a ship's way, with the meridians and parallels; the sides of which triangles are measured by the equal intervals between the concentric quadrants, and the lines N. and S.E. and W.

The lines and arcs are distinguished, every fifth, by a broader line; so that if each interval be taken for one league, there will be five between one broad line and another; and if every interval be taken for four leagues, then there will be twenty leagues, which make a 5th degree, from one broad line to the other.

Now, suppose a ship to have sailed 150 leagues north-east, one fourth north; which is the third point, and makes an angle of 33° 45' with the north part of the meridian. Here are given two things; viz. the course, and the distance failed; by which a triangle may be found on the instrument, similar to that made by the ship's course, and her longitude and latitude; and hence may the unknown parts of the triangle be found.

Thus, supposing the centre A to represent the place of departure; count, by means of the concentric arcs, along the point the ship sailed on, as A D, 150 leagues from A to D; then is the point D the place the ship is arrived at, which note. This done, let DE be parallel to the side A C; and then there will be formed a right-angled triangle A E D, similar to that of the ship's course, difference of longitude, and latitude; the side A E gives 125 leagues for the difference of latitude northward; which makes 6° 15', reckoning twenty leagues to a degree, &c. and the side D E gives 83 lesser leagues answering to the parallels; which
QUAD

which being reduced, as shown above, gives the difference of longitude. And thus is the whole triangle found.

QUADRANT, in Gunnery, called also the gunner's square, is an instrument serving to elevate or point cannons, mortars, &c. according to the places they are to be levelled or directed to.

It consists of two branches, made of brass or wood; one about a foot long, eight lines broad, and one line in thickness; the other four inches long, and of the same thickness and breadth as the former. Between these branches is a quadrant divided into ninety degrees, beginning from the shorter branch, and furnished with a thread and plummet. See its figure represented in Plate I. Gunnery, fig. 5.

The use of this instrument is easy; nothing more being required but to place the longest branch in the mouth of the cannon or mortar, and elevate or lower it, till the thread cuts the degree necessary to hit a proposed object. See Pointing of a Gun.

Sometimes, also, on one of the surfaces of the long branch, is noted the division of diameters, and weights of iron bullets; as also the bores of pieces. See Caliber.

QUADRANT OF ALTITUDE. is an appendage of the artificial globe, consisting of a lamina or flipp of brass, the length of a quadrant of one of the great circles of the globe; and divided into ninety degrees.

At the end, where the divisions terminate, there is a nut riveted on, and furnished with a screw, by means of which the instrument is fitted on to the meridian; and is moveable round upon the rivet, to all points of the horizon. See its figure in Plate XIX. Astronomy, fig. 9.

Its use is to serve as a scale in measuring of altitudes, amplitudes, azimuths, &c. See the manner of its application under the Use of the Globe.

QUADRANTAL, in Antiquity, a vessel in use among the Romans for the measuring of liquids.

It was at first called amphora; and afterward quadrantal, from its form, which was square every way, like a die.

Its capacity was eighty libras, or pounds of water, which made forty-eight sextaries, two urnae, or eight congii.

QUADRANTAL SPACE, in Geometry. See Quadrant.

QUADRANTAL TRIANGLE, is a spherical triangle, one of whose sides at least is a quadrant of a circle, and one of its angles a right angle.

QUADRANTATA TERRA, in our Ancient Law Books, is used for a quarter of an acre, now called a rood; which see.

QUADRAS ISLES, in Geography, islands situated on the W. coast of North America, between Pintard's found and the straits of Fuca; among which lies Nootka's found, which see. They were so called by Capt. Ingraham, after the name of a Spanish commander of two schooners, who passed through this channel in the year 1792.

QUADRAT, Quadratum, called also geometrical square, and line of shadows, is an additional member on the face of the common Guater's and Sutton's quadrants; of some use in taking altitudes, &c.

The quadrant more distinctly exhibited in Plate VI. Surveying, fig. 13. has each of its sides divided into a hundred equal parts, commencing from the extremes; so that the number 100 falls on the angle, representing tangents to the arc of the limb.

The divisions are distinguished by little lines from 5 to 5, and by numbers from 10 to 10; and the divisions being occasionally produced across, form a kind of lattice, consisting of 10,000 little squares.

The proportion here is, as radius is to the tangent of the angle of altitude at the place of observation (i.e. to the parts of the quadrant cut by the thread), so is the distance between the station and the foot of the object, to its height above the eye. See Altitude.

Use of the Quadrat, Geometrical Square, or Line of Shadows. 1. The quadrant being vertically placed, and the sights directed to the top of the tower, or other object, whose height is required; if the thread cut the side of the quadrant marked right shadows, the distance from the base of the tower to the point of station is less than the tower's height. If the thread falls on the diagonal of the square, the distance is equal to the height. If it fall on that side marked verted shadows, the distance exceeds the height.

Hence, measuring the distance, the height is found by the rule of three; inasmuch as there are three terms given. Indeed, their disposition is not always the same; for when the thread cuts the side of right shadows, the first term in the rule of three ought to be that part of the side cut by the thread; the second, the side of the square; and the third, the distance measured. If the thread cut the other side, the first term is the whole side of the square; the second, the parts of the side cut by the thread; and the third, the distance.

For an instance of each. Suppose, e.g. in looking at the top of a steeple, the thread cut the side of right shadows in the point 40, and that the distance measured 20 poles, the case then will stand thus: as 40 is to 100, so is 20 to a fourth term, which we find to be 50; the height of the steeple in poles. Again, supposing the thread to fall on the other side, in the point 60, and the distance to measure 35 poles; the terms are to be disposed thus: as 100 is to 60, so is 35 to a fourth term, viz. 21, the height required. See Altitude.

Use of the Quadrat without Calculation.—The preceding cases may be formed without calculation, where the divisions of the square are produced both ways, so as to form the area into little squares.

Thus, suppose, 1. The thread to fall on 40 in the side of right shadows, and the distance be measured 20 poles; seek among the little squares for that perpendicular to the side which is 20 parts from the thread; this perpendicular will cut the side of the square next the centre, in the point 50, which is the height required in poles.

2. If the thread cuts the side of verted shadows in the point 60, and the distance be 35 poles; count 35 parts on the side of the quadrant from the centre; count also the divisions of the perpendicular from the point 35 to the thread, which will be 21, the height of the tower in poles.

Note. In all cases the height of the centre of the instrument is to be added. See Altitude, and Shadow.

QUADRAT, in Astrology, called also Quadriles, an aspect of the heavenly bodies, in which they are distant from each other a quadrant, or ninety degrees. See Aspect.

QUADRAT, in Printing, is a sort of space; that is, a piece of metal, cast like the letters, to be used occasionally in composing, in order to form the intervals between words, at the end of lines, &c. See Printing.

There are quadrats of divers sizes, as m quadrats, n quadrats, &c. which are respectively of the dimensons of such letters.

QUADRATA, in Ancient Geography; a town of Higher Pannonia, placed on the banks of the Save by Antonine's Itinerary.

QUADRATA, in Geography, a town of Naples, in the province of Bari; five miles N.W. of Ruvo.

QUADRATA is the Italian term in canto fermo for Gregorian or square black notes.

U 2
QUADRATA Legio, among the Romans. See Square Legion.

QUADRATIC EQUATION, in Algebra, is an equation of which the highest power of the unknown quantity rises only to the second degree. If this power enters alone, it is called a simple quadratic; and when the second power and simple quantity both occur, it is termed an affixed quadratic equation, thus:

\[ x^2 + a x = b, \]

is an affixed quadratic, and

\[ x^2 = b, \] or \[ a x^2 = b, \]

is a simple quadratic equation.

Some authors classify all such equations as contain two different powers of the unknown quantity, the one being the double of the other, under the general term quadratics, such as \( x^2 + a x^3 = b, \) \( x^2 + a x^n = b, \) &c. each of which is called a quadratic equation, because their solutions depend upon precisely the same principles as the former.

Every quadratic may be reduced to the form \( x^2 + a x = b; \)

in which it is, however, to be understood, that \( a \) and \( b \) may be either positive or negative; and the general solution of it is expressed by the formula

\[ x = \frac{-a}{2} \pm \sqrt{\left(\frac{a^2}{4} + b\right)}. \]

If we give to \( a \) and \( b \) all the variety of signs they admit of, quadratic equations may be divided into four distinct classes, viz.

1. \( x^2 + a x = -b; \)
2. \( x^2 - a x = -b; \)
3. \( x^2 + a x = +b; \)
4. \( x^2 - a x = +b; \)

and their several roots will be exhibited by the following formulas, viz.

1. \[ x = \frac{-a}{2} \pm \sqrt{\frac{a^2}{4} - b}; \]
2. \[ x = \frac{a}{2} \pm \sqrt{\frac{a^2}{4} - b}; \]
3. \[ x = \frac{-a}{2} \pm \sqrt{\frac{a^2}{4} + b}; \]
4. \[ x = \frac{a}{2} \pm \sqrt{\frac{a^2}{4} + b}. \]

See Equations.

From these forms it is obvious that every quadratic equation has two roots arising out of the ambiguous sign \(+\), prefixed to the second member of the root. It is also obvious, that if in the 1st and 2d form, \( b \) be greater than \( \frac{a^2}{4}, \) the two roots in both forms are imaginary, or impossible; but if \( b \) be less than \( \frac{a^2}{4}, \) then they are in each form both real, being in the 1st both negative, and in the 2d both positive; because the quantity exhibited under the radical form is, in both equations, less than that without the radical; and consequently both the sum and difference will have the same sign as \( \frac{a}{2}. \)

In the 3d and 4th forms, the roots are necessarily both real, but one positive and the other negative; the 3d form having its greatest root negative, and 4th its greatest root positive; as is obvious by inspection.

It is, however, not necessary to consider quadratic equations under these four forms, as the solution of them all may be reduced to one general rule, as exhibited in the preceding part of this article, and which may be given in words as follows. Having reduced the proposed equation to any one of the above forms, the roots of it will be equal to half the co-efficient of the second term, with its sign changed; plus and minus the square root of the square of that half co-efficient prefixed to \( b, \) with its proper sign, whether plus or minus. The principles on which the preceding formulae are obtained, are the following, viz. \( (x \pm \sqrt{\frac{a}{2}})^2 = x^2 \pm a x + \frac{a^2}{4}; \) therefore, if an equation be proposed under the form \( x^2 \pm a x = \pm b, \) by adding \( \frac{a^2}{4} a \) to both sides, we will preserve the equality, and render the first side a complete square, that is, we have

\[ x^2 \pm a x + \frac{a^2}{4} = \frac{a^2}{4} \pm b; \]

and, by extraction,

\[ x \pm \sqrt{\frac{a}{2}} = \pm \sqrt{\left(\frac{a^2}{4} \pm b\right)}; \]

consequently

\[ x = \frac{-a}{2} \pm \sqrt{\left(\frac{a^2}{4} \pm b\right)}, \]

which form includes all the preceding formulae. We shall not here give the solution of any examples, as the reader will find sufficient exercises under the article Equation; but it may not be amiss to shew other methods of obtaining the roots of quadratic equations, viz. by sines and tangents, continued fractions, &c.

The Solution of Quadratic Equations by means of a Table of Sines, Tangents, &c.—Here, referring to our preceding forms, the solution of them may be exhibited as follows:

**Form 1.** \( x^2 + a x = -b. \)

Put \( \frac{2}{a} \sqrt{b} = \sin z; \) then

\[ x = \left\{ -\sqrt{b} \times \tan \left(\frac{1}{2} z\right) \right\} \quad \text{or}, \]

\[ x = \left\{ -\sqrt{b} \times \cot \left(\frac{1}{2} z\right) \right\} \]

**Form 2.** \( x^2 - a x = -b. \)

Put \( \frac{2}{a} \sqrt{b} = \sin z; \) then

\[ x = \left\{ +\sqrt{b} \times \tan \left(\frac{1}{2} z\right) \right\} \quad \text{or}, \]

\[ x = \left\{ +\sqrt{b} \times \cot \left(\frac{1}{2} z\right) \right\} \]

**Form 3.** \( x^2 + a x = +b. \)

Put \( \frac{2}{a} \sqrt{b} = \tan z; \) then

\[ x = \left\{ +\sqrt{b} \times \tan \left(\frac{1}{2} z\right) \right\} \quad \text{or}, \]

\[ x = \left\{ +\sqrt{b} \times \cot \left(\frac{1}{2} z\right) \right\} \]

**Form 4.** \( x^2 - a x = +b. \)

Put \( \frac{2}{a} \sqrt{b} = \tan z; \) then

\[ x = \left\{ +\sqrt{b} \times \cot \left(\frac{1}{2} z\right) \right\} \quad \text{or}, \]

\[ x = \left\{ +\sqrt{b} \times \tan \left(\frac{1}{2} z\right) \right\} \]

The above formulae result immediately from the construction of quadratic equations. Thus, in the two first forms, let \( A B, \) (Plate X11, fig. 6. Analytik), represent \( a, \) and \( C D = \sqrt{b}, \) then \( A D \) and \( D B \) will be the required roots from the known construction of equations. See Construction.

Now here it is obvious that the sin. \( z \) represents the sin. of CED.
QUADRATIC EQUATION.

C E D, and therefore angle D C B, which is \(\frac{1}{2}\) angle C E D, is \(\frac{1}{2}\) angle \(z\). Consequently \(D B = C D \times \tan \frac{1}{2} z\), and \(A D = C D \times \cot \frac{1}{2} z\), because the angle C A D = the angle B C D; which agree with the leading formulæ above given. As to the two latter formulæ for the two first cases, they are obvious without any explanation.

In the 3d and 4th cases, let A B represent \(a\), and D C = \(\sqrt{b}\), then A D and D B will represent the two roots; join B C, and draw D E parallel to B C, so shall C E = B D, and the angle C D E = \(\frac{1}{2}\) the angle B O C. Now here the tan. \(z\) will represent the tan. of B O C, and \(\frac{1}{2} z = C D E\); but C E = B D is obviously equal to D C \times \tan \frac{1}{2} z \times \cot \frac{1}{2} z\); and in the same manner A D = \(\sqrt{b}\) \times \tan \frac{1}{2} z\). The two latter formulæ require no illustration.

The same results might have been obtained, though not perhaps quite so obviously, from the preceding analytical solution.

There are but few cases in which it is advisable to employ the methods above described to the solution of quadratics, and therefore one example will be considered a sufficient illustration.

Exam.—Given \(x^2 + 7 = \frac{1695}{44}\), to find the two roots of the equation by sines and tangents.

Here tan. \(z = \frac{88}{7} \sqrt{1695}\).

\[
\begin{align*}
\log 1695 & = 3.2291967 \\
\log 12716 & = 4.1043505 \\
\log \sqrt{1695} & = 2.0.1248192 \\
\log 88 & = 1.9444827 \\
\log 7 & = 0.8459020 \\
\log \tan z & = 10.697943 \\
\text{whence } z & = 77° 42' 32'' \\
\log \tan \frac{1}{2} z & = 9.9061115 \\
\log \sqrt{1695} & = 1.5624096 \\
\log \sqrt{12716} & = 1.4685211 \\
\text{deduct radius} & = 10.0000000 \\
\log x & = -1.4685211 \\
\text{or } x & = .2941176 \\
\text{the positive root; \ and if cot. } \frac{1}{2} z \text{ be taken} & = \frac{1.5624096}{\sqrt{1695}} = .5183285. \text{ See Bonnycastle's Algebra, vol. i. p. 141.}
\end{align*}
\]

For the solution of quadratic equations by the method of continued fractions, we must refer the reader to the "Élai fur la Théorie des Nombres," by Le Gendre.

The root of a quadratic equation may be exhibited under the form of a continued fund, as follows:

Let \(x^2 - ax = b\), or \(x^2 = ax + b\); then

\[x = \sqrt{b + ax}\]

Or, by substituting for \(x\), under the radical, its whole value \(\sqrt{b + ax}\), we have

\[x = \sqrt{b + ax}\]

Substituting again for \(x\) as above, we obtain

\[x = \sqrt{b + a} \sqrt{b + a} \sqrt{b + ax}\]

and by continuing thus our successive substitutions for \(x\), we have

\[x = \sqrt{b + a} \sqrt{b + a} \sqrt{b + a} \sqrt{b + a} + \&c.\]

which is an analytical expression for the positive value of \(x\) in the proposed equation.

It is obvious, however, that such an expression as this is of little or no use for solving quadratic equations; but we have by means of the latter, a very ready means of finding the ultimate value of such a continued fund. Suppose, for example, the value of the following continued fund were required, viz.

\[\sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}}}\]

Assume

\[x = \sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}}}\]

By squaring both sides

\[x^2 = 12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}} + \&c.\]

Or, since the latter part

\[\sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \&c.}}} = x}\]

this becomes

\[x^2 = 12 + x, \text{ or } x^2 - x = 12\]

whence \(x = \frac{1}{2} \pm \frac{\sqrt{125}}{2} = 4\), which is the value of the infinite fund proposed.

Again, let there be proposed the following infinite fund, viz.

\[\sqrt{5 + 4 \sqrt{5 + 4 \sqrt{5 + 5 + \&c.}}}
\]

Assume the infinite sum = \(x\), then by squaring

\[x^2 = 5 + 4 \sqrt{5 + 4 \sqrt{5 + 5 + \&c.}, \text{ or}}\]

\[x^2 = 5 + 4 x, \text{ or } x^2 - 4 x = 5\]

whence \(x = 2 \pm \sqrt{4 + 5} = 5\), the value sought. For other examples of this kind, see SURDS.

QUADRATING of a Piece, among Gnomers, is the finding that a piece of ordnance be duly placed, and poised in its carriages; and that its wheels be of an equal height, &c.

QUADRATO, in Music. See QUADRO.

QUADRATO-CUBUS, QUADRATO-QUADRATO-CUBUS, and QUADRATO-CUBO-CUBUS, are names used by Diophantus, Vieta Oughtred, and others, for the fifth, seventh, and eighth powers of numbers. See POWER.

QUADRATO-QUADRATUM, or BIQUADRATUM, the fourth power of numbers; or the product of the cube multiplied by the root.

QUADRATRIX, in Geometry, a mechanical line, by means of which we would find right lines equal to the circumference
cumference of circles, or other curves, and of the several parts of it.

Or, more accurately, the quadratrix of a curve is a transcendental curve described on the same axis, the semi-ordinates of which being given, the quadrature of the corresponding parts in the other curve is likewise given. See CURVE.

Thus, e.g. the curve AND (Plate XIII. Analytis, fig. 7.) may be called the quadratrix of the parabola AMC, since it is demonstrated, that $\text{APMA} = \text{AP} \times \text{PN}$, or $\text{APMA} = \text{PN} \times a$, a constant quantity, &c.

The most eminent of these quadratrices are, that of Diocles, and that of Mr. Tschirnhausen, for the circle; that of Mr. Perks for the hyperbola.

The quadratrix of Diocles, is a curve $\text{AM} \cdot \text{m} \cdot \text{m}$ (fig. 8.) by which the quadrature of the circle is effected, though not geometrically, but mechanically; it is thus called from its inventor Diocles.

Its genesis is thus: divide the quadrant arc ANB into any number of equal parts, in $N$, $n$, &c. by a continual bissection; divide the radius AC into the same number of parts in the points $P$, $p$, &c. Draw radii $CN$, $nN$, &c. Lastly, on the points $P$, $p$, &c. erect perpendiculars $PM$, $pm$, &c. The curve formed by connecting these lines is the quadratrix of Diocles.

This curve may be described by continual motion; if we suppose the radius CN by its extreme N to describe uniformly the arc AB, and at the same time a ruler PM, always parallel to itself, to move uniformly along AC, in such a manner that when the ruler PM arrives at C, the radius CN may coincide with CB; and thus the continual intersections of CN with the ruler PM will describe the quadratrix AMD.

Here, from the construction, $\text{ANB}:\text{N}:\text{CA}::\text{AP}$; and therefore, if $\text{ANB} = a$, $\text{AC} = b$, $\text{AN} = x$, $\text{AP} = y$; $a \cdot y = b \cdot x$. See Quadrature.

The quadratrix Tschirnhausiana, is a transcendental curve $\text{AM} \cdot \text{m} \cdot \text{m}$ (fig. 9.) by which the quadrature of the circle is likewise effected; invented by Mr. Tschirnhausen, in imitation of that of Diocles.

Its genesis is thus conceived: divide the quadrant ANB, and its radius AC, into equal parts, as in the former; and from the points $P$, $p$, &c. draw the right lines $PM$, $pm$, &c. parallel to CB; and from the points $N$, $n$, &c. the right lines $NM$, $nm$, &c. parallel to AC. The points A, M, m, being connected, the quadratrix is formed; in which $\text{ANB}:\text{N}:\text{AC}::\text{AP}$. And therefore, if $\text{AB} = a$, and $\text{AC} = b$, $\text{AN} = x$, and $\text{AP} = y$; $a \cdot y = b \cdot x$. See Quadrature.

This curve may be also described by continued motion, if two rulers, $\text{N}$ and $\text{PM}$, perpendicular to each other, be made to move uniformly and parallel to themselves, the one along the quadrant of the circle AC, and the other along the radius.

The term quadrature has now a more indefinite signification; implying, in general, the determination of the area of a figure, without any reference to the geometrical exhibition of it, in a square or other rectilinear form.

All rectilinear figures being immediately reduced to, or dependent upon, the area of triangles, their quadratures have been known from the highest antiquity; but the quadratures of curvilineal spaces are, with very few exceptions, of modern date, two only having been known till near the beginning of the eighteenth century.

The first curvilinear space whose quadrature was accurately determined, was the lune of Hippocrates, of which an account will be found under the article Lunar. Archimedes next found the area of the common parabola; which he obtained in a very ingenious manner, by inscribing an isosceles triangle in the parabola, then two isosceles triangles on the equal sides of the former, four others on thefe, and so on, which he found to have a certain relation, decreasing in the proportion $\frac{1}{3}$, $\frac{1}{4}$, &c. the infinite sum of which series would therefore express the area of the parabola, or the area of all the triangles of which he thus conceived it to be composed; and which sum he found to be $\frac{1}{3}$ or $\frac{1}{4}$ of the circumscribing rectangle. After this time, a period of near two thousand years elapsed, without producing the quadrature of a single curvilinear figure, although the subject seems to have engaged the attention of the most eminent mathematicians during that long interval, particularly the quadrature of the circle. This figure, being the most simple in appearance and construction of any contained under a curve line, was well calculated to excite the curiosity of mathematicians. Archimedes doubtless attempted the solution of this problem; but failing in producing the exact quadrature, he contented himself with giving an approximation, having by the inscription and circumfererion of a polygon of ninety-fix sides, that the diameter being 1, the circumference was greater than $\frac{3}{2} \pi$, but less than $\frac{11}{4} \pi$; and as it was known, even before the time of Archimedes, that the area of a circle is equal to that of a right-angled triangle, whose altitude is equal to the radius, and bisequal to the circumference of the circle, it follows, that the area would be greater than $\frac{3}{4} \pi$, but less than $\frac{7}{4} \pi$.

It would be useless to attempt in this place to enumerate the various absurd quadratures which have been, from time to time, published by minor geometers, with all that conceit and confidence which seldom fail to accompany inferiority. Some attributed their success to divine inspiration; others to their own superior talents: some offered large sums of money to those who should discover any error in their investigation, while others expected great rewards from their government, as a recompence for their discovery, foolishly attaching great importance to a problem, which, if it could be accurately solved, would serve no other purpose but to gratify the curiosity of mathematicians. Many of these attempts, however, have been rendered somewhat amusing by an excess of absurdity. This is particularly the case with regard to the work of Jaime Falcon, a Spaniard of the order of Notre Dame, of Montefia, published at Anvers in 1587. This treatise opens with a dialogue in verse between himself and the circle, which thanks him very affectionately for having squared him; but the good and modest knight attributes all the honour of the discovery to the holy patron of his order. See Montucla's "Histoire des Recherches fur la Quadrature du Cercle;" or his "Histoire des Mathematiques," vol. iv. p. 619.

Referring those readers who have the curiosity to examine the reveries above-mentioned to the two preceding works, we propose to give here an abridgment from the same, of what has
QUADRATURE.

has been done on this subject, by way of approximation. We have already observed that Archimedes was the first who gave an approximation of the ratio of the diameter to the circumference of a circle, placing it between the limits 1 to \(3^{1/8}\) and 1 to \(3^{1/7}\); and it is said that Apollonius and Philo found more accurate approximations, which, however, have not been transmitted to us.

Towards the year 1585, Metius, combatting the false quadrature of Simon Duchène, gave the ratio of 113 to 355, which is very exact, being only \(\pm 0.00027\) in excess. Vieta found a still nearer approximation, carrying it to ten decimals, whereas the former is true only to six places. He also gave a kind of series, the infinite sum of which was equal to the entire circle.

Adriamus Romanus carried the approximation to seventeen figures, and Ludolph van Ceulen to thirty-six; which he published in his work "De Circulo et Adscriptis," and of which Snellius published a Latin translation in 1619. He afterwards verified Van Ceulen's approximation by some theorems of his own invention, which greatly facilitated the computation, and which he published in 1621, under the title of "Willebrordi Snellii Cyclopicus de Circuli Dimensione, &c."

Descartes found a geometrical construction from which it was easy to draw an expression in the form of a series; and Huygens afterwards discovered some curious theorems connected with this subject, but did not advance the approximation, though he made some useful rules for approximating towards the length of the circular arc.

One of the most curious discoveries connected with this subject, which had yet been published, was that given by Wallis in his "Arithmetica Infinitorum," in 1655: where he shews that the ratio of a circle to the square of its diameter, is truly expressed by the infinite fraction

\[
\frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{\ddots}}}}
\]

If we limit ourselves, as we must do, to a finite number of terms, we shall have a ratio alternately too great and too small, according as we take an even or an odd number of terms:

<table>
<thead>
<tr>
<th>Numbers</th>
<th>Approximation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 4, 6, 8, 10, 12, &amp;c.</td>
<td>3.14...</td>
</tr>
<tr>
<td>2, 4, 6, 8, 10, 12, &amp;c.</td>
<td>3.1415926535...</td>
</tr>
</tbody>
</table>

We shall have for the ratio sought, alternately in excess and defect.

In excess, \(3.14159265358979...\)

In defect, \(3.14159265358979...\)

Prior to the above series of Dr. Wallis, however, something of an equivalent expression, though given under a different form, was discovered by lord Brounker, which is as follows. The circle itself being 1, the square of its diameter is expressed by the infinite continued fraction.

\[
1 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{\ddots}}}}
\]

of which the law of the denominators is obvious. See Circle.

Such was the progress which mathematicians had made towards the solution of this interesting problem prior to the invention of fluxions, which, by reducing the quadrature of all curves to one general principle, again revived the hopes of mathematicians with regard to the circle, notwithstanding some pretended demonstrations of its impossibility; and its quadrature was accordingly again attempted with the greatest eagerness. The quadrature of a space, and the rectification of a curve, were now reduced to that of finding the fluent of a given fluxion but still the problem was found to be incapable of a general solution in infinite terms. The fluxion of a given fluent was found to be always divisible, but the converse proposition, viz. of finding the fluent of a given fluxion, could only be effected in particular cases; and amongst the exceptions, to the great regret and disappointment of geometricalians, was included the case of the circle with regard to every form of fluxion under which it could be obtained. Some exceedingly near approximations have, however, since been made towards the true ratio of the diameter to the circumference of the circle, and these belonging rather to the article Rectification than to Quadrature, we shall enter again upon the subject under the former term, and shall occupy the remainder of the present article on the quadrature of curves in general.

On the Quadrature of Curves by Fluxions. In order to exhibit more distinctly and at large the use of fluxions, according to the modern method of notation, in finding the areas of curves, we shall premise the two following cases.

Case 1.—Let \(A R C\) (Plate XIII. Analytis, fig. 10.) be a curve of any kind, whose ordinates \(b, C, B\), are perpendicular to an axis \(A B\). Imagine a right line \(b R\) perpendicular to \(A B\), to move parallel to itself from \(A\) towards \(B\); and let its velocity, or the fluxion of the abscisse \(b\), in any proposed situation of that line, be denoted by \(b d\); then will the rectangle \(b a\) express the fluxion of the generated area \(A B R\), which (if \(A B = a\) and \(b R = y\)) will be \(\frac{1}{2} y x\); whence, by substituting for \(y\) or \(x\) (according to the equation of the curve,) and taking the fluent, the area itself will become known.

Case 2.—Let \(A R M\) (fig. 11.) be any curve whose ordinates \(C R, C C\), are all referred to a point or centre; and conceive a right line \(C R H\) to revolve about the given centre \(C\), and a point \(R\) to move along the said line, so as to describe the curve live \(A R M\). If this point were to move from \(Q\), without changing its direction or velocity, it would proceed along the tangent \(Q S\) (instead of the curve,) and describe areas \(Q C\), \(Q SC\), about the centre \(C\), proportional to the times in which they were described; because, having the same altitude \(C P\), they are as the baces \(Q S\) and \(Q S\). Consequently, if \(R S\) be taken to denote the value of \(\frac{1}{2}\) the fluxion of the curve line \(A R\), the corresponding fluxion
QUADRATURE.

The fluxion of the area $A R C$ will be truly represented by the uniformly generated triangle $Q C S$; which, expressing $C P$ by $t$, will be $\frac{Q S \times C P}{2} = \frac{z'}{2}$; whence the area itself may be determined. But since, in many cases, the value of $z$ cannot be computed (from the property of the curve) without trouble, the two following expressions, for the fluxion of the area, will be found more commodious, viz.

$$\frac{y^2}{2} = \frac{z'}{2} t$$

and

$$\frac{2 S a}{2 a} = \frac{z'}{2} t$$

where $t = R P$, and $x = \text{arc}$ the $A B N$ of a circle, described about the centre $C$, at any distance $a = C B$. These expressions are derived from that above in the following manner; viz. $z = f (C R) = t (R P)$; therefore $z = \frac{y^2}{2}$; consequently $\frac{2}{2} = \frac{z'}{2} t$. Moreover, because the celerity of $R$ in the direction of the tangent is denoted by $z$, that in a direction perpendicular to $C Q$ (whereby the point $R$ revolves about the centre $C$), will, therefore, be $\frac{C P}{C R} \times \frac{x}{y} = \frac{z'}{2}$; which, being to $z$ the celerity of the point $N$ about the same centre as the distance or radius $C R$ ($y$) to the radius $C N$ ($a$); we shall, by multiplying extremes and means, have

$$\frac{a}{y} = \frac{y}{2}$$

and, consequently, $\frac{z'}{2} = \frac{x^2}{2}$. In the examples subjoined, the letters $a$, $y$, $x$, and $u$ shall be used to denote the abscissa, ordinate, curve-line, and area respectively.

**Quadrature of a Right-angled Triangle.** Let the base $A H$ (fig. 12.) be $a$, the perpendicular $H M = b$, and the $A B$ ($x$) be any portion of the base, considered as a flowing quantity, and $B R$ ($y$) the corresponding ordinate. Then, the triangles $A H M$ and $A B R$ being similar, we shall have

$$a : b :: x : y = \frac{b x}{a}$$

Whence $y x$ (the fluxion of the area $A B R = \frac{b x}{a}$; and its fluent (see Inverse Method of Fluxions) or the area itself $= \frac{b x}{2 a}$, which, when $x = a$, and $A B$ coincides with $H M$, becomes $\frac{a b}{2} = \frac{A H \times H M}{2}$

the area of the whole triangle $A H M$. See Mensuration of Triangles.

**Quadrature of a Circular Sector.** Let $A O R$ (fig. 13.) be the sector; $A O$ or $O R$, its radius $= a$, the arc $A R$, considered as variable by the motion of $R$, $z = z$, and $R r = \frac{z}{2}$; the fluxion of the area will be $\frac{a z^2}{2}$; the triangle $O R r$: whence the area itself is $\frac{a z}{2} = A O \times \frac{1}{2} A R$:

that is, the area of any circle is expressed by a rectangle under the half circumference and half the diameter. See Circle.

**Quadrature of a Semicircle.** Let the semicircle be $A R E H$ (fig. 14.); its diameter $A H = a$, $A B = x$, and $B R = y$, &c. and we have $y^2 (B R) = a x - x^2$ ($A B \times B H$), and, consequently, $u (y x) = \frac{x^2}{a} (a x - x^2) = \frac{x^2}{a} \left(1 - \frac{x}{a}\right)$; which expression being resolved into an infinite series, we shall have

$$u = a^2 x^2 \times (1 - \frac{x}{2 a} - \frac{x^2}{8 a^2} - \frac{x^4}{16 a^4} - \frac{5 x^6}{128 a^6} + \&c.) = a^2 x^2 \times (1 - \frac{x}{2 a} - \frac{x^2}{8 a^2} - \frac{x^3}{16 a^3} - \frac{5 x^5}{128 a^5} + \&c.)$$

Whence, the fluent of every term being taken, there will arise $u = a^2 x^2 \times (1 - \frac{x}{2 a} - \frac{x^2}{8 a^2} - \frac{x^3}{16 a^3} - \frac{5 x^5}{128 a^5} + \&c.)$

$$= \text{the area } A B R$$

When $x = \frac{a}{2}$, the ordinate $B R$ will coincide with the radius $O E$; in which case the area becomes $\frac{1}{4} a^2 \times (\frac{a}{2} - \frac{a}{2} - \frac{a}{2} + \frac{a}{2} - \frac{a}{2} + \frac{a}{4})$ and the arc

$$\sqrt{a x} \times \left(1 - \frac{x}{2 a} - \frac{x^2}{8 a^2} - \frac{x^3}{16 a^3} - \frac{5 x^5}{128 a^5} + \&c.\right)$$

of the radius $B R = \frac{1}{4} a^2 \times \left(1 - \frac{x}{2 a} - \frac{x^2}{8 a^2} - \frac{x^3}{16 a^3} - \frac{5 x^5}{128 a^5} + \&c.\right)$

and we shall have

$$\frac{a}{2} \times \frac{x^2}{a} = \frac{y^2}{2 a^2} + \frac{a}{4} \times \frac{x^2}{a^2}$$

and hence, for the whole area of the sector $A O R$; the treble of which, or $0.7853974$ ($A B = \frac{1}{2} A E$), will be the content of the whole quadrant $A O E$; which number, found by taking only four terms of the series, is true to the last decimal place.

We might have found a series of more rapid convergency, but shall here refer that part of our investigation for the article Rectification.

**Quadrature of the Ellipse.** See Lunes.

**Quadrature of the Parabola.** The curve $A R M H$ (fig. 15.), be the common parabola, in which $y^2 (B R)$ $= a x$ ($A B \times a$, the parameter). See Conic Sections. Whence we have $y = a^2 x^2$ and $u (y \times x) = a^2 x^2 \times x$; and, therefore, $u = \frac{a}{2} \times a x^2 \times x = \frac{2 a x^2}{3}$ $\times x = \frac{2 a x^2}{3}$ $\times x = \frac{2 a x^2}{3}$ $\times A B \times B R$. Hence a parabola is $\frac{1}{2}$ of a rectangle of the same base and altitude.

The value of the area may also easily be found in terms of $y$. Thus $x$ being $= \frac{y^2}{a}$, we have $x = \frac{2 a y}{a}$, and $u (y \times x) = \frac{2 a y^3}{3}$ $\times x$; whence $u = \frac{2 y^3}{3 a} \times \frac{2 y}{3} = \frac{2 x^2}{3} \times a x = \frac{2 y^3}{3} x = \frac{2 y^3}{3}$ $\times A B \times B R$. See Parabola.

In the cubic parabola, whose equation is $p^3 x = y^3$; we have
have \( y = \rho^3 x^3 \); multiply this by \( \dot{x} \), and we have \( y \dot{x} = \rho^3 x^3 \dot{x} \), for the fluxion of the area. Therefore fluent \( y \dot{x} = \frac{1}{2} \rho^3 x^4 = \frac{1}{2} \) of \( xy \), that is, area = \( \frac{1}{2} \) of circumscribing rectangle.

And in the same manner, it will be found that in the general parabola, whose equation is \( a^2 x y = c^2 \); the area = 

\[
\frac{a}{n+1} \text{ x circumscribing rectangle.}
\]

**Quadrature of the Hyperbola.** The analytical quadrature of this curve was first given by N. Mercator of Holstein, the first inventor of infinite series. But Mercator finding his series by division, Sir Isaac Newton and M. Leibnitz improved upon his method; the one seeking them by the extraction of roots, the other by a series prefaced. See Hyperbola.

**Quadrature of the Asymptotic Spaces in an Hyperbola.** Let \( D E F (fig. 16.) \) be an hyperbola, of which the asymptotes are \( CM \) and \( CN \); to find the area \( E G H F \), comprehended between the ordinates \( GE \) and \( FH \).

Let \( CG = a, GE = b, GH = x, FH = y \); then by the property of the hyperbola, \( CG \times GE = CH \times HF \), or \( a b = (a - x) y \); or \( y = \frac{ab}{a + x} \); and, therefore, \( y \dot{x} = \)

\[
\frac{a b \dot{x}}{a + x} \text{; the fluent of which is } a b \times \text{ hyper. log. } (a + x),
\]

which fluent, however, requires a correction, for when \( x = a \), the area = 0; but the above expression when \( x = a \) is \( ab \times \text{ hyper. log.} \) of \( a \); therefore, the correction is \( -ab \times \text{ hyper. log.} \) of \( a \); that is, the correct fluent which expresses the area is \( ab \times \text{ hyper. log.} (a + x) - ab \times \text{ hyper. log.} a \).

\( CG \) and \( GE \) each = 1; \( y \dot{x} = \frac{\dot{x}}{1 + x}, \) the fluent of which is \( \text{hyper. log.} (1 + x) \), which requires no correction.

**Quadrature of the Cycloid.** Let \( CAL (fig. 17) \) be a cycloid, \( AD \) the axis, \( A B D \) the generating circle, \( AF \) a tangent at the vertex, \( C F \) parallel to \( AD \). Take any point \( P \) in the arc, and draw \( PM \) perpendicular to \( AM \). Then the fluxion of the external area \( APM = PM \times \text{ the fluxion of } AM \).

Let \( AE = x, AD = 2a; \) then \( BE = \sqrt{(2a x - x^2)} \)

and the fluxion of \( BE = \frac{(a - x) \dot{x}}{\sqrt{2a x - x^2}} \).

Also \( PB = \text{ the arc } BA; \) therefore the fluxion of \( PB = \frac{a \dot{x}}{\sqrt{2a x - x^2}} \); and the fluxion of \( PB + BE \), or of

\[
AM = \frac{(2a - x) \dot{x}}{\sqrt{2a x - x^2}}; \text{ the fluxion of the area}
\]

\( APM, \text{ or } PM, \times \text{ by the fluxion } AM = \frac{(2a x - x^2) \dot{x}}{\sqrt{2a x - x^2}} \).

But the fluent of this fluxion is the same as that found above for a circle, whose radius is \( a \), and verified fine \( x \); that is, the area \( AB \); and, therefore, when \( x = 2a \), the whole external area \( CFA \) is equal to the area of the semicircle \( ABD \). But \( CD \) being equal to the semicircumference \( AD \), the whole rectangle \( CDAF \) = four times the semicircle \( ABD \), and consequently the internal area \( ACD \) = three times the semicircle \( ABD \); or the whole area of

\[
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\]

the cycloid equal three times the area of its generating circle.

**Quadrature of the Logarithm.** Let the subtangent \( PT (fig. 18) = a, PM = x, P = d \); then will

\[
y \dot{x} = a \\
y \dot{x} = a^2 \\
y \dot{x} = a^3
\]

and fluent of \( y \dot{x} = a y \).

Therefore the indeterminate space \( HPMI \), is equal to the rectangle of \( PM \) into \( PT \).

Hence, 1. Let \( QS = z \); then will the indeterminate space \( ISQH = a z \); and, consequently, \( S \times PM = a^2 \), \( a z = a (y - z) \); that is, the space intercepted between the two logoric featherettes is equal to the rectangle of the subtangent into the difference of the featherettes.

2. Therefore the space \( BAPM \) is to the space \( PMSQ \) as the difference of the featherettes \( \overline{AB} \) and \( PM \) is to the difference of the featherettes \( PM \) and \( SQ \). See Logarithmic Spiral.

**Quadrature of the Logarithmic Spiral.** Let \( CBAC (fig. 19) \) be the area proposed; let the right line \( AT \) touch the curve at \( A \), upon which, from the centre \( C \), let fall the perpendicular \( CT \); then, since by the nature of the curve, the angle \( TAC \) is every where the same, the ratio of \( AT \) to \( CT \) will be constant; and, therefore, the fluent of \( \frac{1}{1} \times \frac{y^2}{2} = \frac{1}{1} \times \frac{y^3}{3} = \) the required area.

**Quadrature of the Spiral of Archimedes.** Let \( CR (fig. 20) \) be the curve, whose area \( CRG \) is required. Let \( AC \) be a tangent at the centre \( C \), about which centre, with any radius \( CA \), suppose a circle \( AG \) to be described; then the arc or abscissa \( AG \) corresponding to any proposed ordinate \( CR \), being to that ordinate in a constant ratio (viz. as \( m \) to \( n \)) we have \( x \) (\( AG \)) = \( \frac{m y}{n} \); therefore \( u = \frac{y^2 \dot{x}}{2a \dot{a}} \); consequently \( u = \frac{y^2 \dot{x}}{2a \dot{a}} = \frac{y^2 \dot{x}}{2a \dot{a}} = \frac{6a n}{2a \dot{a}} \).

Since \( b \dot{y} = bx^2 + x \) \( y = \frac{(bx^2 + x^3)}{b} \)

\[
y \dot{x} = \frac{(bx^3 + x^4)}{b^2} \]

flu. \( y \dot{x} = x^3 \)

\( x^3 + 3b - x^4 + 4b^3 \).

**Quadrature of all Curves comprehended under the general Equation, \( y = x^p \times (x + a) \).**

Since \( y = (x + a)^p \)

\[
y \dot{x} = \dot{x} (x + a) \]

Make \( (x + a)^p = v \)

Then \( x + a = v^p \), or \( x = v^p - a \)

Whence \( b = m v^{p-1} \)

\[
y \dot{x} = m v^{p-1} \]

the fluent of which is

\[
\frac{m}{m + 1} = \frac{(x + a)^{p+1}}{m + 1} - \frac{(x + a)^p}{m + 1} \\
\]

Let \( x = 0 \); the remainder will be

\[
\frac{m}{m + 1} \times a \quad \text{Whence,}
\]

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\]
Whence, the area of the curve $\frac{m}{m + 1} \sqrt[4]{(x + a)^2 - (x + a)}$

See on the subject of this article Maclaurin's Fluxions, and Simpson's Fluxions, vol. i. sect. 7, p. 121, &c.

Quadrature, in Astronomy, that aspect, or situation of the moon, when she is 90 degrees distant from the sun.

Or, the quadrature is when she is in a middle point of her orbit, between the points of conjunction and opposition; which happens twice in each revolution, viz. in the first and third quarter.

When the moon is in her quadrature, the exhibits that phases which we call the half-moon, i.e. the phases with just half her face; and is said to be bisected, or dichotomized.

In the moon's progress from the first syzygy, her gravity towards the earth is continually increasing by the action of the sun; and her motion is retarded for the same reason. Her motion then, in her orbit, is slower as her gravity to the earth is greatest when in the quadratures.

In her recess from the quadratures to the first syzygy, the gravity continually decreases, and the velocity increases. The ratio is thus: as radius is to the sun, or difference of one and a half the cosine of half the distance of the moon from the first syzygy, and half the radius; so is the addition of gravity in the quadratures to the diminution or decrease of it in any other situation. See Syzygy.

Hence the moon's orbit is more convex in the quadratures, than in the first syzygy; and hence the circular figure of the moon's orbit is changed into an oval, whose greater axis goes through the quadratures; and hence, also, the moon is less distant from the earth at the first syzygy, and more at the quadratures.

It is no wonder, therefore, that the moon should approach nearer to the earth when her gravity is diminished; so that accses not being the immediate effect of this diminution, but of the inflexion of the orbit towards the quadratures.

In the quadratures, and within thirty-five degrees of them, the apsidal line of the moon goes backwards, or move in antecedentia; but they move forwards in the first syzygy. See Apsides.

The moon's orbit undergoes various alterations in each revolution. Its eccentricity is the greatest when the line of the apsidal line is in the first syzygy; and the least, when in the quadratures.

Considering one entire revolution, the nodes move slower and slower as the moon approaches the quadratures, and they set the time is in them; but considering several revolutions, the nodes go back faster in the quadratures.

The inclination of the plane of the moon's orbit increases as the nodes go from the first syzygy, and is greatest when the nodes are in the quadratures. See Moon and Nodes.

Quadrature, or Lines of Quadrature, are two lines frequently placed on Gunter's sector.

They are marked with the letter $Q$, and the figures 5, 6, 7, 8, 9, 10; of which $Q$ signifies the side of a square, and the other figures the sides of polygons of 5, 6, 7, &c. sides. $S$ there stands for the semi-diameter of a circle; and $90$ for a line equal to ninety degrees in circumference.

Quadratus, in Biography, an early Christian writer, who flourished under the reigns of Trajan and Adrian. He is styled by Jerome and Eusebius "a disciple of the apostles," and he was reported to have been endowed with the gift of prophecy. According to Eusebius, Quadratus presented to the emperor Adrian, in the year 126, an apology for the Christian religion, with a view of mitigating the sufferings inflicted upon the professors of that period. This is supposed to have been the first written apology presented on the same subject to any of the Roman emperors, and it produced a considerable effect on the mind of Adrian. Of this work only a fragment remains, which is preferred by Eusebius, and which is extremely valuable on account of the testimony which it affords to the reality of the miracles of Christ and his apostles, by asserting that some of those miracles were wrought on persons who were living at the time when Quadratus wrote. Nothing is known respecting the time and manner of his death. Lardner.

Quadratus, in Anatomy, a name given to several muscles of the body, on account of their form.

Quadratus Femoris, le carré, is the trochanteric muscle; it is situated at the upper and back part of the thigh, and extends from the tuberosity of the ischium to the great trochanter. It is flattened, quadrilateral, and tolerably thick. The posterior surface is covered by the gluteus maximus, the iliacus, and the semi-membranosus; the anterior surface covers the obturator externus, the extremity of the tendon of the psoas magnus, and the head of the trochanter minor. The superior edge is parallel to the inferior geminus; and the inferior to the upper fibres of the adductor magnus. The inner edge, or origin of the muscle, is fixed to the outer side of the tuberosity of the ischium, in front of the semi-membranosus; the outer is attached to the bony ridge, which runs from the great to the small trochanter. It is tendinous at its two attachments, and fleshy in other parts. It will rotate the thigh outwards upon the pelvis; or, if the former be fixed, it will move the pelvis upon the thigh. When the thigh has been carried upwards and outwards, it will restore the limb to its natural position.

Quadratus Genae, a muscle of the lower lip; see the article Deglutition, where it is described under the name of depressor labii inferioris.

Quadratus Lumbrorum. See Lumbrorum.

Quadratus Occipitalis, a name of the posterior or occipital portion of the Epicanthus; which see.

Quadrella, in Geography, a town of Naples, in Lavora; 20 miles E.N.E. of Naples.

Quadrels, in Building, a kind of artificial stones, perfectly square, whence their name. They are made of a chalky, or whitish and pliable earth, &c. dried in the shade for at least two years.

They were formerly in great request among the Italian architects.

Quadriceps, in Anatomy, a name under which it has been proposed to describe the extensors of the knee-joint, viz. the vastus internus and externus, the crurinus, and rectus; and the adductors of the thigh, with the peltinahs.

Quadriga, formed from quadrus, four, and jugum, yoke, in Antiquity, a car, or chariot, drawn by four horses, haraselled abreast.

Various are the accounts we have of the inventor of the quadriga. Cicero makes it the invention of Minerva. Hyginus attributes it to Erichthonius IV. king of the Athenians; which sentiment Virgil also follows in his Georgics, lib. iii. ver. 111. Eufebius gives Prometheus the honour of it. Tertullian, De Spectac. lib. ix. says, it was invented among the Argians, by Trochilus, in honour of Juno; and at Rome, by Romulus, in honour of Mars, or Quirinus. Ado of Vienna, Chronic. act. iii. will have it to have been invented by one Proclus, about the time of the establishment of the kingdom of Athens. Laziardels, Hist.
Hifi. Univerf. Epitom. lib. xxiv. says the fame of Triptolomus. Latly, if there be not opinions enough already, Herodotus gives us another; and says, the Greeks borrowed it from the Libyans. Pliny tells us, that his feat was a quadriga, lib. xvi.

On the reverses of medals we frequently fee Victory, or the emperor, in a quadriga, holding the reins of the horses; whence these coins are called, among the curious, nummi quadrigratis, and victorlatis. See Bigat.

Quadriga, from quadrat and juga, yokes, in Surgery, a bandage for the sternum and ribs, so called from its resemblance to the trappings of a four-horse car. It was formerly employed in cases of fractured ribs; but, as it is not now in use, a more particular account of it seems unnecessary.

Quadrigemina Corpora, in Anatomy, a part of the brain, known more commonly by the terms nates and telles. See Brain.

Quadrilateral, in Geometry, a figure whose perimeter consists of four right lines, making four angles; whence it is also called a quadrangular figure.

If the several angles be right, the figure is a rectilinear quadrilateral. If oblique, an oblique-angular quadrilateral.

If the sides of a quadrilateral be equal, and the angles right, the figure is a square.

If the sides be equal, but the angles unequal, the figure is a rhombus.

If the angles be equal, and the sides unequal, the figure is a rectangle.

If only the opposite angles and sides be equal, the quadrilateral is a rhomboid.

If the opposite angles and sides be unequal, the quadrilateral is a trapezium.

If any side of a quadrilateral, inscribed in a circle, be produced out of the circle, the external angle will be equal to the opposite, internal angle.

Hence, the two opposite angles of any quadrilateral figure inscribed in a circle, always make two right angles; and, therefore, no oblique-angled parallelogram can have a circle described about it, because its opposite angles being equal, must together be greater or less than two right angles. See Circle.

Quadrill, Quadrilla, a little troop or company of cavaliers, pompously drest and mounted; for the performance of caroufels, julls, tournaments, running at the ring, and other gallant divertisements.

The word is borrowed from the Italian, being a diminutive of quadrata, a company of soldiers ranged in a square: for quadrare is, properly, to dispose any thing square; whence their quadrilla, the French squadrille and quadrille, and our quadrill. The French formerly wrote squadrille, and squadrille.

A regular caroufal is to have at least four, and at most twelve, quadrills.

Of these quadrills, each is to consist of at least three cavaliers, and at most of twelve. The quadrills are distinguished by the form of their habits, or the diversity of their colours.

Quadrille, a well-known game at cards, and whatever has been, in several cafes, the object of mathematical computations. See M. de Moivre’s Doctrine of Chances, 3d edit. p. 97, &c.

Quadrrio, Francesco Saverio, in Biography, a Jesuit, author of a voluminous history and description of every kind of Italian poetry, “Della flora e della Ragione d’ogni Poesia,” eight vols. 4to. published at Bologna between the years 1739 and 1752.

The author seems a mere compiler, without selection, taste, or accuracy. It is a heavy work, hardly interesting enough to stimulate a regular perusal; and from the disorder of arrangement, very difficult to consult. Crecimbeni is as superior to Quadrrio in every requisite of an historian of literature, as Tiraboschi is to Crecimbeni.

Quadripartition, the dividing by four; or a taking of the fourth part of any number, or quantity. Hence quadripartite, &c. something divided into four.

Quadrireme, Quadrigemina, a galley, or vessel, with four oars on a side; the invention of which was attributed by the ancients to the Carthaginians.

Quadrisetæ, the four-haired flies, a term used by the writers in natural history to express those flies of the feticuda or hair-tailed kind, which have four hairs or bristles growing from the tail, as the others have three, two, or one.

Quadrivium, the centre of four ways, where four roads meet and cross each other. By statute, pofts with inscriptions are to be set up at such cross-ways, as a direction to travellers, &c. 8 & 9 W. III. c. 10.

Quadrivium, besides the centre of four ways, was a scholastic division, used in the middle ages in our universities, to express the highest clafs of philosophical learning and science; comprehending arithmetic, geometry, astronony, and music. as the trivium did grammar, rhetoric, and logic. During this period, music, such as it was, must have been highly prized to be ranked with the most sublime sciences, and thought an essential part of a learned education.

Quadro, Ital. literally means square, and in music, at present, it implies a natural, $,$ or Gothic $B$, in opposition to $t$ondo, round, or the round $b$, used for a flat. The durum hexachord is sometimes called the quadro hexachord, from the circumstance of $B$ being $\hat{b}$.

It was the opinion of Padre Martini and the prince abbot of St. Blasius, that accents and points, enlarged, disfigured, and lengthened, became musical characters for time as well as tune. At first, when lines and spaces were used, from their being chiefly employed in a square form for writing the chants established by St. Gregory, they acquired the name of Gregorian notes, quadrata, and in barbarous Latin, quadracta. As the church is now in receiving new doctrines, and generally a century later in admitting those improvements or corruptions in music (the reader may call them which he pleases) that are adopted by the laity as the fortunate efforts of cultivated genius, the notation of chants was at first cenfured and prohibited by several councils; and figurative harmony being regarded as a crying sin by pope John XXII., was formally excommunicated by a bull from the conclave 1321. See Notes, and Time-table.

Quadrugata Tere, in Old Law Records, denotes a team-land; or so much as can be tilled by four horses.

Quadrula, in Natural History, a word sometimes used in the same sense as tessel, and spoken of the cubic pyrites. Sometimes it is used also as the name of those little spangles of shining matter that are mixed among fand. These are generally fragments of tale; and are of various colours, white, yellow, and blackish.

Solinus has used the word quadrula to express the fragments of yellow tale that are found in that sand called ammobrytus, or golden fand. He mistakes these shining particles for mafles of real gold, and makes the sand itself a kind of precious subftance ranked among the gems, and brought from Persia; but in this he does not agree with the rest of the ancients.

Quadruped. The essential character of quadrupeds...
Quadrupeds.

Quadrupeds are distinguished by the number of their feet, from other animals, which have only two feet, as birds; from those which have no feet, as fishes and reptiles; and from those which have more than two feet, as insects.

Aristotle distinguishes quadrupeds into three classes: denominating those whose feet are terminated by a hoof in one piece, *fossipedes*; those which have a cloven hoof he distinguished by the name of forked or cloven-footed; and those whose feet are digitated he called *fipppedes*. With this general division he contented himself, without descending to a methodical distribution of each class into their several orders, genera, &c. Gesner, Aldrovand, Jonston, and many other naturalists, have adopted the distribution of Aristotle: but we are indebted for the regular systematic arrangement of quadrupeds to Mr. Ray, who published his "Synopsis Methodica Animalium Quadrupedum et Serpentini Generis," &c. in 1693. According to this writer, quadrupeds are divided into those which are hoofed, *ungulata*; and those which are clawed, or digitated, *ungulacta*.

1. *Whole-hoofed, *fossipedes, *muropeda, *muropoda, *sole冬dungula*; as the horse and ass, the onager or wild ass, the mule; and the zebra of Africa, or the fine striped Indian or African ass, almost like a mule in form and figure.

Of the whole-hoofed kind, Aristotle has observed, that no one hath two horns (he might have said any horns); no one hath the talus, or *grallagalus*, nor hath the males any appearance of teats.

2. *Cloven-footed*: and that either, 1. Into two divisions only: as the *saoen*, of the bifoliate kind; which are again subdivided into such as are.

First, *Ruminants, *guaprazo; that is, such as chew the cud; and these either have hollow and perpetual horns, as the bull, sheep, and goat kind; or decision horns, as the hart and deer kind, which usually shed their horns annually.

Of the *bull kind* are reckoned these: the common bos or bullock, of which the male is taurus, the female vacca; the German urus, urochs, or urochus; the bifon; the bonasus; the bubalus, or bullaffo; and the bos Africanus of Bellonius, Obs. lib. ii. c. 90, which he takes to be the bubalus of the ancients.

Of the *fleap kind*, besides the common fорт, are reckoned the Arabian ovis laticauda, whose tail is sometimes of thirty pounds weight; the ovis ferox capricorn Cretica Bellonii; the ovis Africana, with short hair instead of wool; and the ovis Guineens, or Angolensis, of Marcgrave, Hist. Brasiil. lib. vi. c. 10.

Of the *goat kind* are, besides the common capra domestica, the ibex, or German steinbock, found on the tops of the Alps; the rupicapra, French chamois, or German gems; the gazella Africana, or antelope; the gazella Indica; the gazella Africana with shorter, annulated, and bent horns; the capra fulvifrons Africana Grinnelli; the capra Mambrina, or Syriaca of Gesner; the bucephalus, or mofehelaphus Caifi, in Gesner; the tragelaphus Caifi, in Gesner; and the tragelaphus of Bellonius.

Of the *hart, or deer kind*, are reckoned, the cervus, *boides*, or red deer; the cervus platyceros, or palmas, the fallow deer; also, or the elk; rauheller, the rein deer; the axis Plinei, according to Bellonius; the caprea Plinei, the euouacu-ate, and euouacu-apa, of Marcgrave; the caprea Groenlandica.

Secondly, of animals whose feet are divided into two parts only, and which do not chew the cud, there is only the hog and swine kind. Under this head, besides the common swine, are reckoned the wild boar, or swine; the Guineens Marcgravii; the porcus Indicus, or babirusa; the tajacu or aper Mexicax mouffierus of Dr. Tyfon, called, by Marcgrave, tajacu casigora; by others, quashita coymat, and quaipizotl; and by Acosta, and some others, zaino.

2. There are some quadrupeds, whose hoof is cloven into four divisions, and these seem to be not ruminant; as the rhinoceros, the hippopotamus, the tapirjere of Brasil, the capy-bar of Brasil, and the animal mouffierian.

Quadrupeds, *Hoofed or Digitate*. Of this kind, there is, first, a fort whose claws are not divided or separated, but adhere to one another, and are covered with one common skin, but with obtuse nails, ficking out round the margin of the foot; as the elephant, which is anomalous, and not clearly referrible to this kind, or to that of cloven-footed quadrupeds.

A second species of this digitate kind of quadrupeds, which has only two claws, is the camel; and though these have no horns, they both ruminate, and have also the four romachs of horned ruminant animals.

Of the camel there are two forts; one having but one hunch on the back, the other two.

To this kind also belong the Peruvian glama, which some have reckoned among the sheep kind; as also the pacos, the ovis Indica, or Peruviana vulgo, which is much less than the glama.

A third species of this ungulate kind includes such animals as the Greeks called *palaeonyes*, and *Achdionyes*, which have the foot divided into many claws, with broad nails on them; as the ape and monkey kind.

Of these, some have no tails, and are called fime, or apes: others have tails, and are called monkieys, cercopitheci; and such as have either long or short tails, if they are of a larger size, are called papiones, or baboons. There are great numbers and varieties of this species of quadrupeds; of which naturalists have described these, viz. the orang-oustang, or homo sylvestris of Dr. Tyfon, described by him in a particular disconue; the guariba of Brasil, Marcgravii; the rupi of Brasil, greater and lesser; the cae of the fame region, described by Lertius; the catina of the fame country; the cercopithecus barbatis Guineenfis, two or three forts of it; the cercopithecus Angolensis major; the cercopithecus non barbatis Clufi; the cercopithecus Cluf. called jagown. Lastly, if apes and monkieys have their foons very prominat, like dogs, they are called cynocephali.

A fourth species of this ungulate kind is, when, though the claws are many, yet they are not covered at the end with broad flat nails, like monkieys or apes; but are rather like the talons of hawks, &c. crooked and sharp-pointed.

Thefe, in respect of their teeth, may be divided into fuch as have many dents primum, or incifors (that is, cutting teeth) in each jaw, of which there are two forts; a greater, which either have a short, round head, as the cat kind; or a leffer fort, having a long flender body, with very short legs, as the weael or vermin kind. There are also some of this species of quadrupeds which have only two large remarkable teeth in each jaw: these are the hare kind; and these live only upon herbs, grans, &c.

Of the *cat kind* of quadrupeds are reckoned to be the lion; the tyger; the pardalis, whole male is pardus, and female panthera; the leopard; the lupus cervarius, or lynx; the catus pardus, or cat-a-mountan; the common cat; and the bear.

Of the *dog kind* are reckoned the wolf; the lupus arceus, or jackall; besides the common dog, of which kind they
they enumerate the mastic, or mallif; the canis venaticus Graius, Græcus, or Scoticus, the greyhound; Graius Hibernicus, or the Irish greyhound; the canis venaticus sagax, indagator, sectator ferarum, &c. the hound; canis venaticus Hispanicus, or aviarious, the spaniel for land or water; vertagus, or tumbler; canis Ovis, or domesticus, the houfe-dog; canis melitæus, or the lap-dog; canis Getulus, or Ilicanius, the fchock: and of all these forts there are many varieties of mongrels, and hybridos breeds.

Other species of the dog kind are, the fox; the animal zibethicum, or civet-cat, as it is corruptly called, but by its teeth and snout is plainly of the dog tribe; the American coati, or rackoon, or rattoon; the yziquepatli; the carigueya, marinucca, carigoy, ropoza, or opolium; the taubii; the taxus, or meles, the badger, grey, or pate; the lutra, or otter. To these some add the phoca, sea-calf or seal; the equus marinus, morfe, or sea-horse, muitaken by fome for the hippocopotamus; the Dutch call him walrus, the Danes and Icelenders rofmarus; laifly, the manti, or vacca marina, the sea-cow.

Of the vermin, or weafel kind of quadrupeds, is, firft, the muftela vulgaris, the common weafl, in Yorkshire called founmart, or flicht; ydak the vijerra Indica, called quill and quirpele; another fort called mungo, and mugathia, of a reddifh-grey; the muftela, ermine, or float, and muftela fylverfis, the ferret; putorius, the pole-cat; martes, or foyna, the martin, or martlet; muftella zibellina, the fable: laifly, the genetta; and the ichneuromon Bolloni.

Of the bare kind of quadrupeds are, firft, the lepus, or the common hare; cuniculus, the rabbit, or coney; tapeti, or Brail coney, and the aperea of Brail; the hylinus, or porcupine, and the hylinus Americanus, or cuanda of Brail; caflor, fiber, or the beaver; fciurus vulg., or fquirrel; the virginianus, Zeylandic, Barбary, and Americanus flying fquirrel; the mus domelificus, major and minor, the common rat and mouse: to these alfo may be referred mus major aquaticus, the water-rat; the mus-chat, mus avellanarum, major and minor; the dormouse or fleepier, mus Noricus, Crictetus, Alpinus, feu marmotta; the cavia cobaya, or cuniculus Americanus, the Guinea-pig; the aguti, and paca of Brail; the mus Norwegicus, or leming; the glis Gfneri, or the rill; the mus Indicus, &c.

QUADRUPEDS, ANOMALOUS. To these feveral kinds, the following anomalous ones mufl also be added:

1. Such four-footed viviparous animals as have a longifh snout, with their feet divided into manv claws, and toes, and having teeth; as the echinus teretirrus, or common urchin, or hedgehog; erinaceus Indicus albus; tatu or armadillo prima of Marcgrave; tatuete of Brail, or the second fpecies of the armadillo, according to Marcgrave; tatu apara, his third fpecies of armadillo; tatu muftelinus, Soc. Rég. Muf. the weafl-headed armadillo; talpa, the mole-warp, or mould-warp; and the mus araneus, flrew, hardy flrew, freamoufe.

2. Quadrupedous and viviparous animals with a longifh snout, having their feet divided into many claws or toes, but without teeth; as the tamandua guacu of Brail, Maregraui, urius formicus Cardani, the great ant-bear; the tamandua of Brail, or Maregraves, the etter ant-bear.

3. Anomalous flying quadrupeds, with a shorter snout, and their feet divided as above; being of the bat kind, or fitter-mice, of which there are severall fizes, and of different forms.

4. There is one very anomalous animal, which has but three claws on each foot; and that is the ai or ignavus of Marcgrave, the floth or fluggard.

5. Viviparous and fanguineous quadrupeds, breathing with lungs, but having only one ventricle in the heart; as the rana aquaticus, the frog, or fpli; rana arborea, the small tree or green frog; bufu, five rubeta, the toad; coldudo, the tortoise, in Greek χελως; of thefe there are land and water ones, and many different species in foreign parts.

6. Oviparous quadrupeds, with a long tail ftreched out horizontally. Such are the lizard kind; as lacertos omnium maximus, the crocodile; cordylus, five caudiverbera, uromatix Græcis, larger than the green lizard; tapayaxin Nove Hispamuce, or lacertos orbicularis of Hernandez; lacertos vulgaris, the common eft, swift, or newt; lacertos viridis, the green lizard; lacertos fuetanum Aldrovandi, at Rome and Naples called the tarantula; lacertos Indicus, called fenembi and ignava; lacertos Brasiliensis, called tejuguaco, and temapara by Marcgrave; the taraguara ameia, the taraguito Arcuraba, Americima, Curapopba, Tiunhama, &c. of Marcgrave; the lacertos Indicus; lacertos venaticus Indicus; lacertos venaticus. This fystem of Mr. Ray obtained very generally among naturalifts, till, in the year 1735, Linnaeus firft published his fystem. This was followed by feveral others, varying in the arrangement of the animal kingdom, even to the laft edition of 1797. Under the clafs, which he denominates Mammalia, (which fee,) he comprehends not only all the animals which we call quadrupeds (the lizard genus, or rather the reptiles pedati excepted), but also the cetaceous order, or whales, cachalots, and porpelles; juftifying this arrangement of whales with quadrupeds, from the agreement of the animals in the structure of the heart, in the repiration by means of lungs, in their having moveable eye-lids and ears, in being viviparous, furrhed with teeth, and other particulars, by which they differ fo materially from fhies, as more than to counterbalance their living with them in the fame element. The mammalia are divided into feven orders, the diûuctions of which are principally eftabhlished on the difference in the numbers, situation, and form of the three kinds of teeth, viz. the primate or incifiers, called fore-teeth, or cutting-teeth; the laniarii or canini, called dog-teeth, canine or lacerating teeth; and the molares, double teeth or grinders. But Linnaeus does not entirely neglect the feet. See the characters of the feveral orders under Primates, Brute, Feræ, Glis, Pecora, Belliu, and Cete or Whale. This part of the Linnean fystem, including a few species defribed in the Appendix of the third tome, and in the Mantilla of 1771, contains about two hundred and thirty species.

Mr. Pennant, in his "Synopfis of Quadrupeds," and professor Martin, in his "Elements of Natural Hislory," by including fome animals that were unknown to Linneaus, and giving the rank of species to feveral that were confidered by him as varieties, have extended the number of mammalia to two hundred and eighty-nine species. Mr. Klein, in 1751, published a new fystem of quadrupeds, intituled "Quadrup. Diplopho brevifique Hil. Natur," in which he distributes them into two orders, the firft comprehending those whole feet are terminated by one or more hoofs, and the second those which are divided, in which of these orders is subdivided into five families or classes. In his firft order he follows the general arrangement of Mr. Ray, which he has considerably improved; but in the second, by a fervile regard to a method founded on the number of toes, he has combined very opposite animals; the camel and the floth, the mole and the
Mr. Buffon, in 1756, published another system, in which he has arranged animals by the number or defect of their teeth; beginning with those that are toothless, such as the ant-eater, and ending with those that have the greatest number, such as the opossum. By this arrangement, some quadrupeds, very distant from each other in their manners, are too nearly connected. We shall lay nothing of Mr. Buffon's "History of Quadrupeds," though it contains much valuable information, because he seems to have disregarded that, fystematic arrangement. Mr. Pennant has introduced some useful alterations in his "History of Quadrupeds;" this ingenious naturalist has followed Mr. Ray in his greater division of animals into bovied and digitated; but, after the manner of Mr. Klein, he has formed separate genera of the rhinoceros, hippopotamus, tapir, and musk. The apes are continued in the rank in which Mr. Ray placed them, and are followed by the mausoeus. The carnivorous animals are arranged according to the system of Linnaeus, omitting the seal, mole, shrew, and hedge-hog. The herbivorous or frugivorous quadrupeds occupy the class assigned to them by Mr. Ray, to which he has allotted likewise the shrews, the mole, and the hedge-hog. The fourth section of digitated quadrupeds confides of those which are absolutely destitute of cutting teeth, such as the sloth and armadillo. The fifth section is formed of those which are destitute of teeth of every kind, such as the manis and ant-eater. The third and fourth orders or divisions which Mr. Pennant has added, are the pinnated and the winged quadrupeds: the first comprehends the walrus, the seals, and (in conformity to preceding writers) the manati. But these, he observes, seem as the links between the quadrupeds and the cetaceous animals. The bats are winged quadrupeds, and form the next gradation from this to the class of birds. See Pennant's Hist. of Quadrupeds, ed. 8vo. 1781. Preface. See Classification.

Quadrupeds, Alated. Among the many fabulous things with which natural history has been loaded, stories of flying quadrupeds seem to claim a very high rank; the griffon, the quadruped dragon, and a great many other imaginary animals, having been introduced so seriously among the descriptions of real animals, that too many have been taught to believe them. Schenck, in his "Phyfica Sacra Jobi," has done much toward disconfounding such relations; and Hyacinthus Gemma, who has written expressly "De Fabulis Animalibus," has added much on the same occasion; yet all is not done. The world have late histories of lemmas and baiflifs, which never existed but in the imagination of the relator, or in the futile contrivance of the fabricator; as is evidently the case in the baiflifs which we find in the museums of the curious, and which are all made out of the ray-fifth. And the generality of readers are so fond of any thing that is marvellous, that these things are sure to be remembered, while perhaps all the truths in the book are forgotten.

Upon the whole, the standard of the flying or alated quadrupeds seems to be properly enough reducible to this: that the words flying and alated are not synonymous terms, and that there are three kinds of flying among the quadruped clafs: the first absolute and swift, flying as perfect as in birds; this peculiarly belongs to the bat; which is the only alated or winged quadrupod, properly speaking.

2. An imperfect flying by means of certain membranes serving as wings, but imperfectly, and not turning quick, or enduring long flights: such is the flying of the lizard, which is not properly an alated animal. And lately, the imperfect flying of the squirrel kind, which even in that species, by way of eminence, the flying squirrel, is not properly flying, but only long leaping: the creature being able to turn but very little out of a right line, and only to suspend itself during a short time in a leap from a high place to a lower. Phil. Trans. N. 247. p. 34.

Quadrupeds, in Agriculture, all such animals as walk on four legs, and are of the domestic kind, as horses, neat cattle, sheep, swine, and many other forts, which are beneficial either for the purposes of working, fattening, or in any other way. Some animals of this nature are disposed of for one of these purposes in preference to others; while others are capable of being made to serve more than one of them. Thus, horses of the lighter and more active kind are adapted to the plough, and some forts of road work, and those of the more heavy fort to all descriptions of team work in the field or other places. And next cattle of the ox kind, in the least heavy breeds, as the Devonshire, Herefordshire, and some others, are well suited to team labour as well as fattening; while those of the more heavy forts, as the Lancashire breed, or long hores, &c. are better calculated for feeding only. Among sheep, some breeds are valuable for their mutton as well as their wool; some for the former, or latter, of these articles only; and others again for their ready disposition in taking on fleec. In swine, some breeds are much better formed than others; require much less food, in proportion to their sizes, in keeping and fattening, and are more disposed to feed, &c.

The fame is likewise the cafe with some other animals of this description, which should constantly be taken into the account in feeding and choosing them for the use of the farmer.

Quadrupeds of all sorts, should also, in all cafes, he well adapted in their numbers, nature, and kinds, to the qualities of the lands as farms, their extents, and the quantities of labour to be performed upon them, as much in the success of farming depends on this being properly done. They should likewise be constantly well kept and in proper condition, according to the different intentions for which they are designed, as badly fed or half-starved animals never answer any good purpose for the farmer, they always requiring a much larger proportion of food for rearing or bringing them again into proper order and for fattening them, than would otherwise have been necessary; and they never ultimately turn out so well, or produce so much advantage, as might have been the cafe under other circumstances. And, in labouring animals, where this is the cafe, they are never capable of performing nearly so much work, in conformance of which a vaft continual los is fubfained, though scarcely perceived. See Live-Stock, and Team.

Quadruplatores, among the Romans, were formers, who had the fourth part of the confiscated goods for their pains.

Quadruple, a sum or number multiplied by four, or taken four times.

Quadruple is particularly used for a gold coin, worth four times as much as that of which it is the quadruple.

The quadruple of the Spanish pitole is a piece of four pifoles, called also the double doubloon.

The quadruple of the louis d'or is a piece of gold coined in the reign of Louis XIII. in 1641. The legend on one side is CHRISTUS VINCIT, REGNAT, IMPERAT; and on the middle of this side it has a crofs with four crowns, and en- can toned in four fleurs-de-lis; on the other side it has the legend, LUDOVICUS DECIMUS TERTIUS DEI GRATIA FRANCO- RUM REX, with the head of Louis XIII. Its value under this king was twenty livres.

Quadruple Groche, in French Muffe, is a note with four hooks or four ties, one degree quicker than our demi-semiquaver,
QUA

feniquaver, and for which we have no name. The term
raab, in French a quaver, is not derived from crochet, but
from the tail being crooked. And why our crochet, with a
straight tail, has its name, is a whimsical absurdity, for which
we are unable to account.

QUELA, in Pleading, is used to supply the want of
a traverse. (2 Litt. Abs. 405.) In a clausum frigat
such a day, the defendant pleads the plaintiff's libence
to him to enter on the same day, and that vice versa he entered;
he need not say, que el cadem transgredi.

QUELA Plura, a writ that anciently lay where inquisition
had been made by an escheator, of such lands or tenements
as any man died seised of, and all was supposed not to
be found by the office or inquisition.

This writ was to inquire what more lands or tenements
the parties died seised of. But it is now made ufeles, by
taking away the courts of wards and offices post mortem.

QUIR. See Pers quaerita.

QUERENS non inventi peccatum, a return made by
the sheriff upon a writ directed to him with this clause, in
v. Si A. accuserit B. secumur de clamoribus pro suo profugendo, &c.
F. N. B. 38.

QUAERENS, in Geography, a town of Norway; 55
miles N. of Romfal.

QUESTA, in our Ancient Writers, denotes an indulgence,
or remission of penance, exposed to sale by the
popes.

QUESTIONARII, in our Ancient Law Books, were
people who went about with indulgences from door to door,
defining charity either for themselves or others.

Matt. Well observes, 1240, that the king, "Terram fuan
per papae quminarios, depauperari, &c. permitit."

QUESTOR. See Questor.

QUESTUS, in Laws, is that eflate, or those effects,
which a man hath by acquisition or purchase; in contradifion
to hereditas, which is what he hath by descent. See
Acquirt, and Goods.

Glanv. lib. vii. "aut habet hereditatum tantum, vel
quemquam, aut hereditatem & quemam."

QUAG, in Agriculture, a name given to any fort of wet,
wampy, moras, or boggy situation in land, which has a
tremulous or shaking feel under the foot, and which
produces nothing but a coarse grasy herbage that is unfit
for the food of animals. Low as well as high grounds are sub-
ject to spots of this kind where water is confined and ret-
tained near the surface. They are to be removed by proper
means of draining, and the application of solid earthy matters
of different kinds upon the surfaces of them, with the ufe
of rollers in order to consolidate the whole. See Bog and
Swamp.

QUAGGA, in Zoology. See Equus.

QUAGLIATI, PAOLO, in Biography, the music-maker
of the celebrated traveller, Pietro della Valle, at Rome, in
the beginning of the 17th century. His disciple, della
Valle, says, that he was an excellent maestro di cappella,
who introduced a new species of music into the Roman
churches, not only in compositions for a fingle voice (mono-
dio), but for two, three, or four, and very often more voices,
in chorus, ending with a numerous crowd of many choirs or
chorusles, finging together; specimens of which may be seen
in many of his motets that have been fince printed.
And the music of my ear, or moveable-flage, composed
by the fame Quagliati, in my own room, chiefly in the man-
ner he found most agreeable to me, and performed in walks
through the streets of Rome during the carnival of 1696,
was the first attempt at an opera, or fucular drama in music,
which had been heard in that city." See Opera, Reci-
tative, and Pietro della Valle.

QUAGMIRE, in Agriculture, the name of a fort of soft
merry flaeking or quaking bog, swamp, or moras, which is fre-
quently and commonly met with in low hollow situations,
where there is none, or very little decant, for the discharge
of the flagnant water or wetnesses. They are formed in
many different ways according to the nature of the circum-
stances which first gave rise to them, and of that of the places
in which they are found. The author of the "Treatise on
Landed Property" has remarked, that besides the common
moory quagmires or bogs, there is a species which is con-
stantly charged with moisture, yet does not accumulate a
thick covering of moory earth, owing probably, it is sup-
pofed, to the want of fertility in the water by which it
fed. These forts of quagmires are, in his opinion, for the
moll part, found in mountainous and hilly situations. Other
kinds are occasionally seen on large peat mofts, and hollow
meadows, in spots where the water is confined and kept
up nearly to their upper parts, and where there is much
decay of vegetable production on their surfaces, and the
reception of earthly materials from other places. These
quagmires occupy large spots of ground in many different
situations, and are, of course, a great loss to individuals
and the public, as little or nothing of any ufe is ever pro-
duced by them. (See Morass.) They are, for the most
part, capable of being readily drained by proper means,
a fort of improvement which ought never to be neglected
where it can be performed with any chance of success.

QUAHU, in Geography, a district of Africa, on the
Gold Coast, in the kingdom of Accambo, or Aquambo;
which fee.

QUAHVITLA, in Botany, a name used by some au-
thors for the tree from which the resin commonly called gun
copal is procured.

QUAICHA, in Geography, a town of Africa, in Sen-
nar; 38 miles E.S.E. of Gischam.

QUAIL, Coturnix, or Tetrao coturnix of Linnaeus, in
Ornithology, the leaf of all the birds of the gallinaceous kind.
They have, however, the genius of the cock kind, and may
be bred to fight like our game cocks.

This was an old custom among the Athenians, and is still
kept up in some parts of Italy, and in Afa.

Quails are birds of paflage, some entirely quitting our
island, others shifting their quarters from one county to an-
other, and sheltering themselves among the weeds near the
sea-fide; with us they frequent the corn-fields, and some-
times the meadows. They begin to finge in April, and make
their nests in the month of May, building on the ground,
and seldom lay more than from five or seven whitifh eggs,
marked with ragged earth-coloured spots.

Quails are to be taken by means of the call during their
whole whole winter time, which lasts from April to Augulf.
The proper times for using the call are at fun-rising, at nine
o'clock in the morning, at three in the afternoon, and
at fun-set; for these are the natural times of the quail's call-
ing. The notes of the cock and hen-quail are very different,
and the sportsman who expects to succed in the taking of
them, must be expert in both; for when the cock calls, the
answer is to be made in the hen's note; and when the hen
calls, the answer is to be made in the cock's. By this
means they will come up to the person, so that he may, with
great ease, throw the net over them, and take them. If a
cock-quail be finge, on hearing the hen's note he will imme-
diately come; but if he have a hen already with him, he
will not forfake her. Sometimes, though only one quail
answers to the call, there will three or four come up; and
and then it is best to have patience, and not run to take up the first, but stay till they are all entangled, as they will soon be.

The quail is a neat cleanly bird, and will not run much into dirty or wet places: in dewy mornings they will often fly instead of running to the call; and in this case, it is best to let them go over the net, if it so happens that they fly higher than its top, and the sportsman then changing sides, and calling again, the bird will come back, and then will probably be taken in the net.

The calls are to be made of a small leather pursé, about two fingers wide, and four fingers long, and made in the shape of a pear; this is to be stuffed half full of feathers and at the end of it is to be placed a small whistle, made of the bone of a rabbit's leg, or some other such bone; this is to be about two inches long, and the end formed like a flageolet, with a little soft wax. This is to be the end fastened into the pursé; the other is to be closed up with the same wax, only that a hole is to be opened with a pin, to make it give a distinct and clear sound. To make this sound, it is to be held full in the palm of the hand, with one of the fingers placed over the top of the wax: then the pursé is to be pressed, and the finger is to shake over the middle of it, to modulate the sound it gives into a fort of thake. This is the most useful call; for it imitates the note of the hen-quail, and seldom fails to bring a cock to the net, if there be one near the place.

The call that imitates the note of the cock, and is used to bring the hen to him, is to be about four inches long, and above an inch thick; it is to be made of a piece of wire, turned round and curled, and covered with leather; and one end of it must be closed up with a piece of flat wood, about the middle of which there must be a small thread or strip of leather, and at the other end is to be placed the same sort of pipe, made of bone, as is used in the other call. The noise is made by opening and closing the spiral, and gives the same sound that the cock does when he gives the hen a signal that he is near her.

Quakers, in Ecclesiastical History, the common denomination of a society of Christians, who appeared first in England about the middle of the seventeenth century, and who continue to be distinguished from others by peculiar tenets and practices. They call themselves Friends. They are remarkable for affecting the continuance, to the present time, of immediate revelation, or the communication of divine instruction to the mind, by the testimony of the spirit of God. This revelation they affirm to be necessary for the production of true faith, and that it neither does nor can contradict the outward testimony of the scriptures, or right and found reason. Their doctrine on this subject has been often misunderstood, even by theological writers; and they have in consequence been subjected to much obloquy. It is, however, the principal feature in that peculiar view of Christianity, which has occasioned their separation from other churches.

Origin and History.—Before the period above mentioned, many serious persons, satisfied with none of the modes of religion which the reformation brought forth, had withdrawn from the communion of every visible church, to cultivate in retirement, impressions which they attributed to the operation of the spirit of Christ on their own minds: it is chiefly from such, when brought to recognize each other by the ministry of an individual, that the Quakers consider their society to have been originally gathered. George Fox, the individual in question, was born in 1624. He has left a journal of his own life, written with a simplicity of style, which proves that he has fairly laid open his own character. In this work, the peculiar principles of Quakerism may be satisfactorily explored in their early beginnings, which it may be worth while briefly to review. Fox's parents, who were pious members of the church of England, had intended him for the priesthood, his character affording very early promise of fitness for religious service; but others perceiving to the contrary, he was put under a matter to a country business. Being engaged herein at a fair, when about the age of nineteen, a cousin of his, with another professor of religion, attempted to engage him in drinking to intoxication. "The Lord had shown me," says George, "that I might not eat or drink to make myself wanton, but for health, using the creatures in their service, as servants in their places, to the glory of Him who created them."

Accordingly, on perceiving the design of his companions, he rose up; paid for the refreshment they had had, and departed, with emotions of virtuous indignation. Returning home, he paced a sleepless night, walking up and down, and crying to the Lord; who, he affirms, said unto him, "Thou feest how young people go together into vanity, and old people into the earth; thou must for sake all, young and old, keep out of all, and be as a stranger unto all." The reader will understand this, and generally all revelations professed to have been received by Quakers, as confounding not in an outward voice, but in an internal communication to the mind. Taking the command literally, he detached himself from his connexions; and having some property of his own whereon to subsist, removed from place to place, observing the religion and professors of the age, without engaging in close fellowship with any. He devoted much of his time to fasting, solitary prayer, and reading the bible.

He became at length quite detached in his affections from the world, distrait at the spiritual condition of his fellow men, and in much anxiety, bordering on despair, about his own; yet was not without intervals of heavenly joy and comfort. Such a state of mind naturally led him to seek for spiritual counsel from others, and he had conferences with many of the clergy, beginning with his own parish priest. In answer to a question from the latter, we find him professing faith in Christ, who, by his death as man, (for he died not as he was God,) became an offering for the sins of the whole world. The general result of these conferences was, however, unsatisfactory to him; "for," he observes, "they could not reach my condition." Pursuing, therefore, his meditations on the subject as before, he came to be satisfied respecting several propositions which it involved, such as the following:—that although it was said that all Christians are believers, both Protestants and Papists, yet that none were truly such, but those who were born of God, and who had palled from death unto life. Again, that to be bred at Oxford or Cambridge, was not enough to fit and qualify men to be ministers of Christ. At this he wondered, because it was the common belief that such qualification was sufficient. "At another time," he says, "it was opened to me, that God, who made the world, did not dwell in temples made with hands. This at first seemed strange, because both priests and people used to call their temples or churches dreadful places, holy ground, and the temples of God; but the Lord showed me clearly that he did not dwell in those temples, which men had commanded and set up, but in people's hearts." George Fox now ceased to attend the established preachers; at which his relations being offended, he shewed them from the scriptures, "that there was an anointing within man to teach him, and that the Lord would teach his people himself."
QUAKERS.

Observing, as he thought, more of the fruits of this internal teaching among the "diligent people," he went for a while among them; but, he continues, "as I had forborne the preachers, so I left the separate preachers also, and those called the most experienced people; for I saw there was none among them all that could speak to my condition. And when all my hopes in them, and in all men, were gone, so that I had nothing outwardly to help me, nor could tell what to do, then, I then, I heard a voice, which said, 'There is One, even Christ Jesus, that can speak to thy condition.' When I heard it my heart did leap for joy. Then the Lord let me see why there was none that could speak to my condition, namely, that I might give him all the glory. For all (he continues, alluding to Rom. xi. 32.) are concluded under sin, and shut up in unbelief, as I had been, that Jesus Christ might have the pre-eminenence, who enlightens and gives grace, faith, and power."

The preceding is a specimen of Fox's own account of the manner in which the doctrine he afterwards preached arose in his mind. The reader will perceive that he refers all his real edification to the means which have been already indicated, immediate revelation. He says, "though I read the scriptures, that spoke of Christ, and of God, yet I knew Him not but by revelation, as he who hath the key did open, and as the Father of life drew me to his Son by his Spirit." Yet that he was sensible of the importance of the holy scriptures, as the source from whence, under this influence, Christian instruction must be drawn, is evident, both from his declaration that they were very precious to him, and from his having incessantly used, and continually appealed to them, both before and after beginning to promulgate his system.

Having at length attained to a view of Christianity in which he found peace of mind, he believed himself required and divinely commissioned to become a teacher of it to others: and from the year 1647, the reader may conceive him always engaged in this office. He travelled as before, preaching first to small companies of enquiring persons, then to public congregations, such as upon his appearance among them were willing to hear him, and at length to large assemblies of people, convened on purpose. This he did with the courage and perseverance of a reformer; in the face of opposition from the national and diocesan preachers, of frequent personal abuse from their hearers, and occasional severe treatment by the magistrates. In most places where he came, he met with persons who received his doctrines, a proportion of whom, after associating with him for a time, became imprest with the like apprehensions of duty to propagate their principles; which they attempted by similar methods. Thus, although interrupted at different periods by imprisonment, he found himself, before many years had elapsed, in connection with a numerous band of fellow-labourers, and a widely diffused and respectable society of religious friends. No inconsiderable number of these quitted, for the sake of their principles, livings in the church, commissions in the army, or seats as magistrates.

When we consider that this happened in an age equally remarkable for religious zeal and political turbulence, it will appear that some deviations from Christian propriety, some fruits of the mixture of imagination with good intentions, could scarcely fail to be exhibited among them. If the new society, from a regard to its principle of internal impulses to particular duties, was slow to condemn thefe, it was careful, on the other hand, not to engratify them, by imitation on its practice. Individuals, therefore, were alone responsible for such acts, and the general conduct of the members, from the period of their first associating together, was found in no mean degree conformable to the morality of the gospel.

The most serious instance of misconduct occurred in the case of James Nayler and his followers. This fell out in 1656. and was magnified beyond its real importance by being suffered to occupy for ten days the attention of parliament. Nayler had been an Independent, and a quarter-master of horse under major-general Lambert. He was one of George Fox's earliest converts, and for some years an able preacher and disputant in the same cause. Coming to London, he found a set of people who extolled him in his office above measure. His friends, and George Fox among the rest, seeing his danger, gave him suitable cautions; but flying thence, he became exposed to the flatteries of a train of followers, chiefly women, whom he suffered, at length, from a delusive notion of its being done to Christ in him, to address him with the name and titles of the Saviour, and with acts amounting to worship. In particular, his entrance into Bristol was conducted, by these intimated people, in imitation of the procession of Christ into Jerusalem. The parties implicated in this transaction were committed to prison; but Nayler alone was elected by parliament, after examination and long debates on his cafe, for punishment as a blasphemer. Cromwell kept aloof from the proceedings, which, by their excessive severity, moved great commotion in the public. The culprit was twice scourged through the streets, twice pilloried, branded in the forehead, and bored through the tongue with a hot iron; all which he endured with surprizing patience and fortitude.

His punishment ended with two years' close imprisonment in Bridewell, during which he attained to repentance, and a founder mind. Having given proof of this by several public confessions, the Quakers, who had disowned both him and his followers, received him back into their communion, in which he lived circumspectly the short remainder of his life.

Quakerism prevailed at first chiefly in the northern counties; but many preachers having risen up here, who travelled in different directions, it was not long in spreading to the metropolis, and the remoter southern and western parts. Wherever its professors appeared, the ordeal of suffering awaited them; for which their negative tenets commonly furnished the occasion. They refused to the priests every kind of payment, to the government military service, to the magistrate's oaths, and to all persons the customary, and at that time much looked for worship, of kneeling or bowing with the head uncovered. They adhered too, in every instance, to their northern English of thou and thee, judging the plural mode of addressing one person to have originated, together with all empty titles, in a spirit of flattery unbefitting Christian. These peculiarities were a check to superficial conversions; since an upright conformity to the profession was in most cafes purchased by the loss of friends, contempt, and hardships. Even the privilege of meeting to worship, apart from the national congregations, was acquired only by persevering in the practice, through almost every kind and degree of coercive obstruton, down to the period of complete toleration, the revolution of 1688. Hence their history confits in great part of a detail of buffettings, imprisonments, and spoiling of goods. So early as 1639 they flated to parliament, that in the preceding six years about two thousand individuals had suffered in prison and exile, for being Quakers: and this representation was accompanied by one of the most extraordinary public acts on record. One hundred and sixty four Friends offered themselves by name to the house, to be imprisoned in the places of an equal number, who from sickness or the hardships...
ships of their confinement, were conceived to be in danger of perishing. The house, however, rejected this proposal, and expressed some displeasure at "the reflections on magistracy and ministry," said to be contained in the memorial. It will be proper to give some particular instances of their sufferings.

James Parnell, a youth of good parts and education, going to see George Fox in a dungeon at Carlisle, became a convert to his principles: and, preaching in Erex, was the means of rousing many congregations of Quakers in that county. He was imprisoned in Colchester castle, and at the age of nineteen under the cruel treatment there inflicted on him. In 1656, two Quaker women arrived at Boston, New England. They were apprehended 'ere they could land, committed to close prison, and searched in a brutal manner, by flapping them naked, lest they might also be "slices"; an object to the colonists of equal and equally rational dread. These two, with eight others who arrived afterwards, were forcibly sent away: but the precaution was in vain, their principles entered the colony. An aged citizen, and church member of Boston, was first found favourably inclined to them; he was fined, imprisoned, and banished in the depth of winter. In Rhode Island he was hospitably received by an Indian chief, who offered, if he would live with him, "to make him a warm house;" observing, "What a God have the English who deal so with one another about their God?" So far is intolerance from recommending the religion of those who practice it. Penal laws against Quakerism soon followed the appearance of this people in New England. The scourge was first applied, without regard to age or sex: mutilation, by cutting off the ears, followed: but these being found insufficient, cruelty proceeded through another intermediate step, banishment on pain of death, to its dreadful extreme; and four Quakers were hanged at Boston. Their names were William Robinson, Marmaduke Stevenon, William Leddra, and Mary Dyar. Their cases, as related by Sewel, in his "History of the Quakers," form an interesting piece of martyrology.

Charles II., on notice of these proceedings, granted a mandamus, which prevented further executions in the colonies; but he was not equally ready to reinstate persecution at home. The Quakers had several meeting houses in London. When assembled at these, they were often disturbed by soldiers, under the direction of the magistrates; these effected their purpose by severe beatings with their arms. One John Trowel being evidently mortally wounded in this way, a coroner's inquest was held, but the verdict of the jury was suppressed: and the king, on being informed of the facts, evaded interference, telling the complainants to prosecute the law against the soldiers! Similar proceedings took place at Colchester; where the congregation, being kept out of their house, met for many weeks in winter standing in the street. Here they were assailed by soldiers on horseback, who wounded many of them, and a man of seventy lost his life in consequence. On one of these occasions a soldier's sword, by violent ufage, came out of the hilt. The man he had been beating handed it up to him with these words, "I dare the Lord may not lay this day's work to thy charge." In this instance, as in others, the patience of the sufferers at length triumphed, and they were quietly allowed their right of meeting.

In 1665 a hundred and twenty Quakers were in Newgate, sentenced to transportation, under an act recently made "to prevent and suppress felonious conventicles." The matters of ships generally refusing to carry them, an embargo was laid, and it was made a condition of failing to the West Indies, that some Quakers should be taken thither by every vessel. A mercenary wretch being at length found for the service, the Quakers, unwilling to be active in their own banishment, refused to walk on board, as did also the seamen to hoist them in. By the help of soldiers from the Tower, fifty-five of them were at length shipped. But the matter was now in prison for debt: and the ship, after seven months' detention, quitting the coast, was immediately taken by a Dutchman, and twenty-eight of the prisoners (the remainder having died of the plague) were liberated in Holland and sent home. Other parties of Quakers were set on shore again from different vessels, so that the number actually sent to the West Indies was small.

The preceding instances may serve to shew the kind of persecution which this society endured for many years; it may be observed in conclusion, that the court (or rather the clergy) of Charles, in their eagerness to suppress the growing society, actually defended to the measure of inflicting a formal order of council for demolishing their meeting-house in Southwark, which was addressed to no less a person than Christopher Wren, esq., surveyor-general of his majesty's works; but it was executed by the military, by whom the congregation, who had the courage to meet on the ruins, were dragged on as often as they assembled, for nearly three months together, without however overcoming their firmness.

Though the Quakers never sent out missionaries, in the manner of some other societies, we have seen that individuals went, under apprehensions of religious duty, to distant parts. Several of these visited Italy, where they did not conceal their dislike of superstition; and one John Love, being detained at Rome on this account, died (as it seems a violent death) in the prison of the inquisition. Catherine Evans, and Sarah Cheever, after three years' confinement, and many sufferings in the inquisition at Malta, were released and returned to England. But the most extraordinary enterprise, in this way, was performed by Mary Fisher, a maiden, and one of the two who had been so ill treated at Bolton. She, apprehending she had a message from God to Fulton Mahomet IV., actually made her way from England to his camp before Adrianopolis, where she delivered, through his interpreter, what was on her mind, was treated with respect, and offered an escort to Constantinople, which she declined, and returned, as he had gone, alone and in perfect safety. A young man, named George Robinson, went, through still greater difficulties, to Jerusalem, where, speaking against the superstition of the pilgrims, the friars persuaded him to be forced into a mosque, whence the Turks, on his refusing to turn Mahometan, led him out to be put to death, as for wilfully violating the place: but a sudden change taking place in their sentiments concerning him, he also was permitted to return.

In 1666 the Quakers held their first general meeting, for the care of their poor and other concerns of the society, at Skipton in Yorkshire; within a few years after which, meetings for discipline were established throughout England and Ireland, chiefly by the incautious personal labours and epistolary recommendations of George Fox. At this period the society received a considerable accession of respectability by the conversion of William Penn and Robert Barclay. The celebrated Apology of the latter gave the world an opportunity of fairly appreciating doctrines till then but partially known, and on this account the more decried: and the settlement of the Jerseys, and subsequentially, of Pennsylvanian, under the auspices of Penn, opened to the Quakers a new and promising field of increase, which they did not fail speedily to occupy. Another peril of con-
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Credible learning, George Keith, after associating with them for near thirty years, became the author of a fchism, the circumstances of which it will be proper to notice. Keith was a native of Scotland, and educated at Aberdeen; he was imprisoned, as a Quaker, in 1664, and in 1675 assisted Barclay in a public difputation againft the students at Aberdeen; he wrote much in defence of the principles of the Quakers, which he thoroughly understood, and was employed in the education of their youth; but is thought by them to have indulged too much in curious and ufeful speculations, which his brethren did not encourage. Being again repeatedly imprisoned, about 1684, he removed to America in difgrace. Here, after some previous general cenfure of his friends, he accused several, in particular, of gross error in doctrine; the pretext for which was, their holding (as he himself had done) that the knowledge and belief of the history of Chrift is not neceffary for the salvation of thofe who have no poffible means of acquiring it. His complaints againft individuals leading to more general cenfure, the Friends in England interfered, and the parties were heard before the yearly meeting in London, which decided the caufe againft Keith, and he remained under the "difownment" pronounced againft him in America. He now set up a feparate Quakers' meeting in London, attacked the principles he had formerly defended, (on which occasions the Quakers replied by quotations from his own works,) and finally entered into the church of England. He was foon after ordained priet, and made a millionaiy to America, to bring over his former brethren. But his efforts, though for a while troublefome to the Quakers, were attended with very little succefs; he returned to England, funk into obscurity on a small living in Suflefs, and his party gradually disappeared.

The jeopardy in which the Quakers almost conftantly flood on account of their principles, very early introduced them to an immediate intercourse with the throne; and they thus acquired the privilege, which they fill exercise, of prefent- ing public addresses to the king, by a deputation from their body, in a manner which does not violate their confequences fcruples. The accession of a new sovereignt, the conclusion of a peace, or an impending war, have commonly been drawn from them addresses, in which sentiments not unworthy of their Chriftian profession, are conveyed in fimple but re- fpeftful language. And very recently (1814,) they availed themfelves of the prefece in this country of the emperor of Russia, and the king of Prufia, to address each of their monarchs in favour of a perfect toleration in their re- fpective dominions; in which they met with a favourable reception. Another great and interesting object, the abolition of the slave trade, has fuddenly brought them forward to government in this way. In the caufe of humanity, as it regards the opprefled Africans, they have proved themfelves ftrong and indefatigable: the reproach, even of holding a fellow man in slavery, was wiped away from the members of this fociety many years before the abolition of the trade was decreed, either in England or America. This was ef- fected by their discipline; and it was made a part of this, in confequence of that view of Chriftianity, which regards every individual of the human race as a fit object of its benefits, and as entitled to the charitable regard which it incalculates. Much was done on the Negroes' behalf, in America, by Anthony Benezet, whose character is well known to the world; and by John Woolman, a minifter of the fociety, whose writings difcover a mind of uncommon purity, simplicitv, and tendernefs.

The Quakers as a body have been long relieved from actual perfecution; yet they are fuil involved by their principles in occasional trouble as individuals. The refufal to bear arms, or to pay military fines, subjects them to legal diftrait on their goods, and if none of these be found, to improprefion. Tithes and other ecclefeal claims, enforced upon them, likewise render diftrait a very common, and fometines an oppreflive occurrence; and if the profeétor be more rigorous, they may be imprisoned for an indefinite time. In America they are exempt from ecclefeal but not from military defigures; by which, during the war for independence, many of them were impoverifhed. It is obvious that, refusing to swear, they cannot fill any office of profit or trust under government. Except for these purpofes however, for serving on juries, and in cafes of criminal prosecution, their folemn afurance before the magiftrate has the legal force of an oath.

The Quakers are dispersed over the united kingdom, and most of the fates of North America; from the southern fates of the latter they have mostly emigrated of late to the Ohio. In America they are chiefly engaged in agriculture; and for a series of years have been making judicious and fuccesful efforts to introduce this, with the other arts, and the manners of civilized life, among the Indian natives. There are a few Quakers in Germany, and their principles are entertained by fome perfons in France.

In this country they are found chiefly in the middle clafs of citizens, and in trade or manufacture. Their general dif- rellition of agriculture feme to have refulted from the im- pediments offered by the tithing fystem: a yoke which, under their fcruple, becomes doubly heavy on the farmer. There is a greater approach to equality in the civil condition of the Quakers, than obtains in almof any other body: the children of fuch as become very rich are apt to quit the fociety, either by marrying perfons not in its communion, or for the fake of liberties which it prohibits: and the children of the poor commonly get a plain but folid education, fuperior to their condition, by means of which they rife in civil fociety to a higher level. They have feveral excellent eftablifhments for this purpofe: the principal of which, fituated at Ackworth in Yorkshire, contains, of both sexes, three hundred children, and was founded in 1778, at the infiance of Dr. Pothergill. With provision for mathematical and claffical learning, the Quakers, though they have fome good private fchools, are yet flanderly furnished; and they have in confequence few accomplished men in these branches. They are by no means deficient in general information, and of late years many of them have cultivated natural philofophy with fuccefs. The fociety in its earlier stage, including many men of regular fcholafhic education, who had joined it on principle, had of confequence the advantage, in point of theological knowledge, over the modern Friends, who chiefly inherit their profeflion, and whose education has but of late begun to include fystematic instruction in the doctrines of Chriftianity at large.

In morals they are allowed to excel: their youth is watched over in this respect with more than ordinary care; and when grown up, their discipline prohibits, to all conditions, those amufements which refer to the mind the ready means of dilipating ferious impreffions. Habitual offenders againft their peculiar regulations forfeit their membership, as well as thofe who violate the more obvious rules of juftice and morality: their moral character, and confiftency as a body, are thus kept up. But it is alleged, that they are not equally well guarded againft a money-getting spirit; which is apt to grow upon thofe who intently preferue trade and commerce to the exclusion of all other pursuitis. From the occasional tenor of the fociety's advices to its members, it shoud seem that this is in a certain degree true; and that it

behaves
behaves them to seek for an adequate remedy. They are not, however, chargeable with the love of money for its own sake; no class of men being more beneficent, or more prompt to contribute their time and substance to various public institutions, which the spirit of the Christian religion has at length roused up, for relieving the distressed, promoting the comforts, and improving the moral and religious condition of mankind.

As to the minuter features of their character, the Quakers are prudent and methodical in their business; generally good economists of time and money. Their conversation has many peculiarities; some of which flow from their principles, others merely from their associating chiefly among themselves. They were early thought to be habitually crafty ("the Quaker fly," says Pope); but there seems no other ground for this, than the extreme caution with which they incur engagements, or make prophecies and promises. Viewed at a distance, they appear cold, formal, and reserved in their manners; and have been unjustly concluded void of domestic cheerfulnes, and incapable of the enjoyments arising from social converse, and the intercourse of cultivated minds. They are plain in their dress; the peculiarities observable in which result, not from any regulations on the subject, but from an indigitation to vary with the fashion; they have, however, slowly followed changes which have proved general and permanent, and thus become less conspicuously singular. Mourning habits they reject on principle: and with a people whole ordinary dress is so grave, the moral reason for them seems not to exist. They are averse to splendour in furniture and equipage: though the rich among them, in these articles, and most of their females in drefs, have contrived, without ceasing to be known as Quakers, to refine considerably upon absolute simplicity.

Doctrine.—A recent publication on behalf of the society, entitled, "A Summary of the History, Doctrine, and Discipline of Friends," ascribed to one of the society, held in high estimation, viz. Mr. J. G. Bevan, who died while this article was in the press, states their doctrine as follows:

"We agree with other professors of the Christian name, in the belief of one eternal God, the creator and preserver of the universe; and in Jesus Christ his Son, the Messiah, and mediator of the new covenant.

"When we speak of the gracious display of the love of God to mankind, in the miraculous conception, birth, life, miracles, death, resurrection, and ascension of our Saviour, we prefer the use of such terms as we find in scripture; and contented with that knowledge, which divine wisdom hath been meet to reveal, we attempt not to explain those mysteries which remain under the veil; nevertheless we acknowledge and assert the divinity of Christ, who is the wisdom and power of God unto salvation.

"To Christ alone we give the title of the Word of God, and not to the scriptures; although we highly esteem these sacred writings, in subordination to the Spirit, from which they were given forth; and we hold with the apostle Paul, that they are able to make wise unto salvation, through faith which is in Christ Jesus.

"We revere those most excellent precepts, which are recorded in scripture to have been delivered by our great Lord, and we firmly believe that they are practicable and binding on every Christian; and that in the life to come every man will be rewarded according to his works. And further it is our belief, that, in order to enable mankind to put in practice these sacred precepts, many of which are contradictory to the unregenerate will of man, every man coming into the world, is endued with a measure of the light, grace, or good Spirit of Christ; by which, as it is attended to, he is enabled to distinguish good from evil, and to correct the disorderly passions and corrupt propensities of his fallen nature, which mere reason is altogether insufficient to overcome. For all that belongs to man is fallible, and within the reach of temptation; but this divine grace, which comes by Him, who hath overcome the world, is, to those who humbly and sincerely seek it, an all-sufficient and present help in time of need. By this, the snares of the enemy are detected, his allurements avoided, and deliverance is experienced through faith in its effectual operation: whereby the soul is translated out of the kingdom of darkness, and from under the power of Satan, into the marvellous light and kingdom of the Son of God.

"Being thus persuaded that man, without the spirit of Christ inwardly revealed, can do nothing to the glory of God, or to effect his own salvation; we think this influence especially necessary to the performance of the highest act of which the human mind is capable; even the worship of the Father of lights and of spirits, in spirit and in truth: therefore we consider all oppositions to public worship, all forms which divert the attention of the mind from the secret influence of this unction from the Holy One. Yet, although true worship is not confined to time and place, we think it incumbent on Christians to meet together, in testimony of their dependence on the heavenly Father, and for a renewal of their spiritual strength; thus, 'Each not only partakes of the particular refreshment and strength which comes from the good in himself, but is a share of the whole body, as being a living member of the body, having a joint fellowship and communion with all.' Barclay.

"Nevertheless, in the performance of worship, we dare not depend, for our acceptance, on a formal repetition of the words and experiences of others; but we believe it to be our duty to lay aside the activity of the imagination, and to wait in silence to have a true light of our condition bestowed upon us; believing even a single light, arising from such a tenue of our infirmities, and of the need we have of divine help, to be more acceptable to God, than any performances, however specious, which originate in the will of man. If any should object the difficulty of laying aside the activity of the imagination, let such consider the following statement—That it is our duty to maintain a watch over our thoughts, by endeavouring to preserve our attention from being carried away by such as manfully originate in our own natural will or habits, and to wait patiently for the arising of the life of Christ, which by bringing every thought into subjection, produces a true inward silence, and therein affords a true sense of our condition.

"From what has been said respecting worship, it follows that the ministry we approve must have its origin from the same source; for that which is needful for a man's own direction, and for his acceptance with God, must be eminently to enable him to be helpful to others. Accordingly we believe, that the renewed affiance of the light and power of Christ is indispensably necessary for all true ministry; and that this holy influence is not at our command, or to be procured by study, but is the free gift of God to chosen and devoted servants. Hence arises our testimony against preaching for hire, in contradiction to Christ's positive command, 'Freely ye have received, freely give,' and hence our conscientious refuial to support such ministry, by tithes or other means.

"As we dare not encourage any ministry, but that which we believe to spring from the influence of the Holy Spirit, we neither dare we attempt to restrain this ministry to persons of any condition in life, or to the male sex alone; but,
as male and female are one in Christ, we hold it proper that such of the female sex as we believe to be endued with a right qualification for the ministry, should exercise their gifts for the general edification of the church; and this liberty we esteem a peculiar mark of the gospel dispensation, as foretold by the prophet Joel, and noticed by the apostle Peter.

Three are two ceremonies in use among most professors of the Christian name, water-baptism, and what is termed the Lord's supper. The first of these is generally esteemed the essential means of initiation into the church of Christ; and the latter, of maintaining communion with him. But as we have been convinced that nothing short of his redeeming power, inwardly revealed, can set the soul free from the thraldom of sin: and this power alone we believe salvation to be effected. We hold that as there is one Lord and one baptism, so his baptism is one, in nature and operation; that nothing short of it can make us living members of his mystical body; and that the baptism with water, administered by his fore-runner John, belonged, as the latter confessed, to an inferior and decreasing dispensation.

With respect to the other rite, we believe that communion between Christ and his church is not maintained by that, or by any other external performance, but only by a real participation of his divine nature through faith: that this is the supper alluded to in the Revelation; Behold I stand at the door and knock: if any man hear my voice, and open the door, I will come in to him, and will sup with him, and he with me, and that where the substance is attained, it is unnecessary to attend to the shadow: which doth not confer grace, and concerning which, opinions so different, and animosities so violent, have arisen.

Now, as we thus believe that the grace of God, which comes by Jesus Christ, is alone sufficient for salvation, we can neither admit that it is conferred on a few only, while others are left without it; nor, thus affrighting its universality, can we limit its operation to a partial cleansing of the soul from sin, even in this life. We entertain worthy notions both of the power and goodness of our heavenly Father, and believe that he doth vouchsafe to afflict the obedient to experience a total surrender of the natural will, to the guidance of his pure unerring Spirit: through whose renewed affixture they are enabled to bring forth fruits unto holiness, and to stand perfect in their present rank.

There are not many of our tenets more generally known than our testimony against oaths, and against war. With respect to the former of these, we abide literally by Christ's positive injunction, delivered in his sermon on the mount, 'Swear not at all.' From the same sacred collection of the most excellent precepts of moral and religious duty, from the example of our Lord himself, and from the correspondent convictions of his Spirit in our hearts, we are confirmed in the belief that wars and fightings are, in their origin and effects, utterly repugnant to the gospel; which still breathes peace and good-will to men. We also are clearly of the judgment, that if the benevolence of the gospel were generally prevalent in the minds of men, it would effectually prevent them from oppressing, much more from enslaving, their brethren (of whatever colour or complexion), for whom, as for themselves, Christ died; and would even influence their conduct in their treatment of the brute creation, which would no longer groan, the victims of their savor, or of their false ideas of pleasure.

Some of our tenets have in former times, as hath been shewn, subjected our Friends to much suffering from government; though to the falterere principles of government, our principles are a security. They inculcate submission to the laws, in all cases wherein conscience is not violated. But we hold, that as Christ's kingdom is not of this world, it is not the business of the civil magistrate to interfere in matters of religion, but to maintain the external peace and good order of the community. We therefore think perfection, even in the smallest degree, unwarrantable. We are careful in requiring our members not to be concerned in illicit trade, nor in any manner to defraud the revenue.

It is well known that the society, from its first appearance, has diffused those names of the months and days, which having been given in honour of the heroes or false gods of the heathen, originated in their flattery or superstitious; and also the custom of speaking in a jargon in the plural number, as having likewise arisen from motives of adulation. Compliments, superfluity of apparel, of furniture, and of provision for the table, outward shows of rejoicing and mourning, and the obsequies of days and times, we esteem to be incompatible with the simplicity of a Christian life; and public diversions, gaming, and other vain amusements of the world, we cannot but condemn. They are a waste of that time which is given us for nobler purposes; and divert the attention of the mind from the sober duties of life, and from the reproofs of instruction, by which we are guided to an everlasting inheritance.

To conclude, although we have exhibited the several tenets which distinguish our religious society, as objects of our belief; yet we are sensible that a true and living faith is not produced in the mind of man by his own effort; but is the free gift of God in Christ Jesus, nourished and increased by the protracted operation of the Holy Spirit in our hearts, and our proportionate obedience. Therefore, although for the preservation of the testimonies given us to bear, and for the peace and good order of the society, we deem it necessary that those who are admitted into membership with us, should be previously convinced of those doctrines which we esteem essential; yet we require no formal subscription to any articles, either as a condition of membership, or a qualification for the service of the church. We prefer judging of men by their fruits, and depending on the aid of Him who, by his prophet, hath promised to be for a spirit of judgment to him that heareth in judgment. Without this, there is a danger of receiving numbers into outward communion, without any addition to that spiritual sheep-fold, whereof our bled Lord declared himself to be both the door and the shepherd; that is, such as know his voice, and follow him in the paths of obedience.

To this statement may be added the following extracts, the first of which is from a declaration issued on behalf of the society in 1693.

We sincerely profess faith in God by his only-begotten Son Jesus Christ, as being our light and life, our only way to the Father, and also our only Mediator and Advocate with the Father:—that God created all things, he made the worlds, by his Son Jesus Christ, he being that powerful and living Word of God by whom all things were made; and that the Father, the Word, and the Holy Spirit, are One, in divine Being inseparable; One true, living, and eternal God blessed for ever;—yet that this Word or Son of God, in the fulness of time, took flesh, became perfect Man, according to the flesh descended and came of the seed of Abraham and David, but was miraculously conceived by the Holy Ghost, and born of the Virgin Mary, and also, farther, declared powerfully to be the Son of God, according to the Spirit of sanctification, by the resurrection from the dead—that, as Man, Christ died for our sins, rose again, and was received up into glory in the heavens; he having, in his dying for all, been that one, great, universal offering and sacrifice for peace, atonement, and reconciliation between God and man; and he is the propitiation.
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The doctrine of the resurrection of the dead is so connected with the Christian religion, that it will be also proper to say something on this subject. In explaining our belief of this doctrine, we refer to the 15th chapter of the Epistle to the Corinthians. In this chapter (verses 46, 47, 48, 49, 50) is clearly laid down the resurrection of a body, though not of the same body that dies. Here we rest our belief in this 'mystery,' without desiring to pry into it beyond what is revealed to us; remembering that secret things belong unto the Lord our God, but those things which are revealed belong unto us and to our children. Principles of Religion, as professed by the Quakers, by Henry Tuke.

Discipline: from the "Summary," with some abridgment.—"The purposes which our discipline hath chiefly in view, are, the relief of the poor, the maintenance of good order, the support of the testimonies which we believe it is our duty to bear to the world, and the help and recovery of such as are overtaken in faults: in a few words, the promotion of piety and charity.

In the practice of discipline, we think it indispensable that the order recommended by Christ himself be invariably observed. If thy brother shall trespass against thee, go and tell him his fault between thee and him alone: if he shall hear thee, thou hast gained thy brother; but if he will not hear thee, then take with thee one or two more, that in the mouth of two or three witnesses, every word may be established; and if he shall neglect to hear them, tell it unto the church.

To effect the faithful purposes of discipline, meetings were appointed, at an early period of the society, which, from the times of their being holden, were called quarterly meetings. It was afterwards found expedient to divide the districts of those meetings, and to meet more frequently; from whence arose monthly meetings, subordinate to those held quarterly. At length, in 1660, a Yearly Meeting was established, to superintend, assist, and provide rules for the whole; previously to which general meetings had been occasionally held.

A monthly meeting is usually composed of several particular congregations, situated within a convenient distance from each other. Its business is to provide for the subsistence of the poor, and for the education of their offspring; to judge of the sincerity and fineness of persons appearing to be convinced of the religious principles of the society, and desiring to be admitted into membership; to excite due attention to the discharge of religious and moral duty; and to deal with disorderly members. Monthly meetings also grant to such of their members as remove into other monthly meetings, certificates of their membership and conduct; without which they cannot gain membership in such meetings. Each monthly meeting is required to appoint certain persons, under the name of overseers, who are to take care that the rules of their discipline be put in practice; and when any case of complaint, or disorderly conduct, comes to their knowledge, to see that private admonition, agreeably to the gospel rule before mentioned, be given, previously to its being laid before the monthly meeting.

When a case is introduced, it is usual for a small committee to be appointed, to visit the offender, to endeavour to convince him of his error, and to induce him to forswear and condemn it. If they succeed, the person is by minute declared to have made satisfaction for the offence; if not, he is divested as a member of the society.

In disputes between individuals, it has long been the decided judgment of the society, that its members should not sue each other at law. It therefore enjoins all to end their differences by speedy and impartial arbitration, agreeably to rules laid down. If any refuse to adopt this mode, or, having adopted it, to submit to the award, it is the direction of the yearly meeting that such be divested.

Weekly meetings also belong to the union of marriages; for our society hath always ered to acknowledge the exclusive authority of the priest in the solemnization of marriage. Those who intend to marry, appear together, and propose their intention to the monthly meeting; and if not attended by their parents or guardians, produce a written certificate of their consent, signed in the presence of witnesses. The meeting then appoints a committee to inquire whether they be clear of other engagements respecting marriage; and if, at a subsequent meeting, no objections be reported, they have the meeting's consent to solemnize their intended marriage. This is done in a public meeting for worship, towards the close whereof the parties stand up, and solemnly take each other for husband and wife. A certificate of the proceedings is then publicly read, and signed by the parties, and afterwards by the relations, and others as witnesses. Of such marriages the monthly meeting keeps a record: as also of the births and burials of its members. A certificate of the date, of the name of the infant, and of its parents, signed by those present at the birth, is the subject of those here mentioned records; and an order for the interment, counter signed by the grave maker, of the other. The naming of children is without ceremony. Burials are also conducted in a simple manner. The body, followed by the relations and friends, is sometimes, previously to interment, carried to a meeting; and at the grave a pause is generally made; on both which occasions it frequently falls out, that one or more friends present have somewhat to express for the edification of those who attend; but no religious rite is considered as an essential part of burial.

Several monthly meetings compose a quarterly meeting. At the quarterly meeting are produced written answers from the monthly meetings, to certain queries respecting the conduct of their members, and the meeting's care over them. The accounts thus received, are digested into one, which is sent, also in the form of answers to queries, by representatives, to the yearly meeting. Appeals from the judgment of monthly meetings are brought to the quarterly meetings; whose business also it is to assist in any difficult case, or where remissions appear in the care of the monthly meetings over the individuals who compose them.

The yearly meeting has the general superintendence of the society in the country in which it is established: and therefore, as the accounts which it receives discover the state of inferior meetings, as particular exigencies require, or as the meeting is impressed with a sense of duty, it gives forth its advice, makes such regulations as appear to be requisite, or excites to the observance of those already made; and sometimes appoints committees to visit those quarterly meetings which appear to be in need of immediate advice. Appeals from the judgment of quarterly meetings are here finally determined, and a brotherly correspondence, by epistles, is maintained with other yearly meetings.

"In this place it is proper to add, that, as we believe
women may be rightly called to the work of the ministry, we
also think that to them belongs a share in the support of our
Christian discipline; and that some part of it wherein their
own sex is concerned, devolve on them with peculiar pro-
propriety. Accordingly they have monthly, quarterly, and
yearly meetings of their own sex, held at the same time with
those of the men; but separately, and without the power of
making rules.

In order that those who are in the situation of ministrers
may have the tender sympathy and counsel of those of either
sex who, by their experience in the work of religion, are
qualified for that service, the monthly meetings are advised
to select fish among the denomination of elders. These,
and ministers approved by their monthly meetings, have
meetings peculiar to themselves, called meetings of ministers
and elders; in which they have an opportunity of exciting
each other to a discharge of their several duties, and of ex-
tending advice to those who may appear to be weak, without
any needful exposure. Such, it may be here observed, as
believe themselves required to speak in meetings for worship,
are not immediately acknowledged as ministers by their
monthly meetings; but time is taken for judgment, that the
meeting may be satisfied of their call and qualification. It
will also sometimes happen, that such as are not approved
will obtrude themselves as ministers, to the grief of their
brethren; but much forbearance is used towards those, before
the disapprobation of the meeting is publicly testified.
These meetings of ministers and elders are generally held in
the compass of each monthly, quarterly, and yearly meeting.
They are conducted by rules prescribed by the yearly meet-
ing, and have no authority to make any alteration or addition
to them. The members of them unite with their brethren in
the meetings for discipline, and are equally accountable to
the latter for their conduct.

It is to a meeting of this kind in London, called the se-
cond-day's morning meeting, that the revifal of manuscripts
concerning our principles, previouseiy to publication, is in-
terested by the yearly meeting held in London: and also the
granting, in the intervals of the yearly meeting, of certificates
of approbation to such ministers as are concerned to travel in
the work of the ministry in foreign parts; in addition to those
granted by their monthly and quarterly meetings.

The yearly meeting of London, in the year 1675, ap-
pointed a meeting to be held in that city, for the purpose of
advising and affilting in cafes of suffering for conscience-fake,
which hath continued with great use to the society to this
day. It is composed of friends under the name of corre-
pondents, chosen by the severa quarter meetings, and who reside in or near the city. The same meetings also ap-
point members of their own in the country as correspondents,
who are to join their brethren in London on emergency.
The names of all these correspondents, previously to their
being recorded, are submitted to the approbation of the
yearly meeting. Such men as are approved ministers are also members of this meeting, which is called the Meeting
for Sufferings; a name arising from its original purpose, and
which is not yet become entirely obsolete.

The yearly meeting has intrusted the meeting for suffer-
ings with the care of printing and distributing books, and
with the management of its flock; and, considered as a
standing committee of the yearly meeting, it hath a general
care of whatever may arise, during the intervals of that
meeting, affecting the society, and requiring immediate at-
tention: particularly of those circumstances which may oc-
casion an application to government. The fice of the yearly
meeting, just mentioned, is an occasional voluntary contri-
bution, expended in printing books, salary of a clerk for
keeping records—the passage of ministers who visit their
brethren beyond seas—and some small incidental charges;
but not, as has been falsely supposed, the reimbursement
of those who suffer distress for tithes and other demands with
which they were to comply.” — G. Fox's Journal. Sewel's
History of the Quakers. Gough's History of the Quakers.
Belle's Sufferings of the Quakers. Barclay's Apology.
Clarkson's Portraiture of Quakerism.

The editor is indebted for the historical part of the pre-
ceding article to a respectable member of the society of
Friends. Mr. Clarkson's work, which was composed in
consequence of his intimate personal acquaintance with many
of its leading members, produced by his labours for the aboli-
tion of the slave trade, may be consulted for a more ample ac-
count of the manners, practices, and opinions of this society.

QUAKER-TOWN, in Geography, a poit-town of Ame-
rica, in Bucks county, Pennsylvania; 184 miles from
Washington.

QUAKING-Bog, in Agriculture, a name usually given
to a fort of soft pulpy, flexible, earthy depositions, which
are formed in hollow moist situations, in consequence of the
fotation of water in them in some manner or other. Bags
of this kind differ much in their nature, qualities, and pro-
perities, according to the difference of circumstances and
situations, but they have all a tremulous motion under the
foot, when capable of being trodden upon. See Bog and
Quagmire.

Draining is here equally necessary, as in all other cafes
of a similar kind, and may most be carried into execution
without any great difficulty.

QUAKING-Grass, in Botany, so called from the trembling
of the little pendulous spikelets, occasioned by their capil-
lar zigzag walks. See Briza.

QUAKING-Grass, in Agriculture, the common name of a
fort of grases, which is laid to thrive and flourish well on
most kinds of poor cold land, and which cattle eat in a
greedy manner; but which is not much adopted for cultivation
in grases grounds, though it makes tolerably good hay.
See Briza.

QUAKU, or Quaqua, in Geography, a district of
Africa, on the Gold Coast.

QUALATCHE, a town of the state of Georgia; 40
miles W.N.W. of Tegusco.

QUALE, in Botany, a Caribbean name, used by An-
blet, and inadvertently adopted by Schreber; possibly be-
cause, as it appears, he suspected the genus not to be suf-
ciently distinct from *Viych* of the same author, his own Cu-
cullaria; see that article. Wildenow, however, has fol-
lowed him; and thus one name more is added to dunghill,
which some future botanical Hercules must sweep away,—
—Clafs and order, Monandria Monogynia. Nat. Ord. per-
haps Gutifera. Juss.

Gen. Ch. Cal. Perianth inferior, of one leaf, in four very
deep ovate, concave, concave, unequal segments; the two
lowermost larger, spreading widely. Cor. Petals two, un-
curled, inserted into the calyx; the uppermost erect, round-
ilip ed, emarginate, terminating at the base behind, in a short,
obtuse, horn-like nectary, projecting between the upper seg-
ments.
ments of the calyx; lowermost largest, flapping downward. Stem. Filament solitary, short, ascending, bent with the lower petal and the germ; anther oblong, furrowed, recurved. Pis. Germin superior, globose; style thread-shaped, ascending, the length of the stamens; stigma obtuse. Peric. Berry? of one cell. Seeds numerous, imbedded in pulp. Obs. The corolla is, as it were, two-lipped. This genus is akin to *Cucullaria*. Schreb.


1. Q. *rofus*. Labl. Guian. 1. 1. *Wild*. n. 1. — Lower petal undivided. Leaves elongated at the point. — Native of the wood of Guiana, flowering in September. The inhabitants call this species *Labaco*. A tree, whose trunk is fixt for or more in height, terminating in large spreading branches. Wood red, compact. Leaves opposite, in pairs crouching each other, on shortish stalks, elliptical, three or four inches long, entire, smooth, with an elongated blunt point; their transverse veins very numerous, straight and parallel. *Steptou* deciduous. Panicles terminal. Flowers numerous, two inches long, powerfully and agreeably scented, white on the outside, rose-coloured, and finally yellowish, within.

2. Q. *carules*. Labl. Guian. 1. 2. *Wild*. n. 2. — Petals two-liped. Leaves with a short point. — Native of the Guiana forests. This species flowers in October, and is known by the name of Qualé. It differs from the former in having smaller flowers, of a grey or blueish colour, but fragrant like those of *Q. rofus*. Their petals are emarginate, or almost obcordate. Points of the leaves less elongated.

**QUALIFICATION for killing game, for jurors, judges, members of parliament, and electors of members.** See Game, Jury, Justices, and Parliament.

**Qualifications for a complete musician, required by Zarlingo.** This venerable theorist had very exalted ideas of a perfect musician, and tells us (Inlit. vol. ii. part iv. p. 342, et seq.) that it is necessary he should have a knowledge in arithmetic, for the calculation of musical proportions; of geometry, to measure them; of the monochord and harmonichord, to try experiments and efficacies; that he should be able to tune instruments, in order to accustom the ear to distinguish and judge of intervals; that he should sing with truth and taste, and perfectly understand counterpoint; that he should be a grammarian, in order to write correctly, and yet words with propriety; that he should read historie, to know the progress of his art; be a master of logic, to reason upon, and investigate the more abstruse parts of it; and of rhetoric, to express his thoughts with precision; and, further, that he would do well to add to these sciences acquaintance with natural philosophy, and the philosophy of sound; that his ears being perfectly exercised and purified, may not be easily deceived. And adds, that he who aspires at the title of perfect musician, has occasion for all these qualifications, as a deficiency in any one of them will frequently render the rest useless. An additional qualification is now become necessary to be added to those enumerated by Zarlingo, which is a perfect knowledge of the genius and powers of all the instruments for which a musician writes; otherwise he will not only embarrass a performer by ufeles and unmeaning difficulties, but lose opportunities of producing effects by the bow of a violin, the coup de langue of flutes, and a selection of the purest and best tones on other wind instruments.

**Qualifications of Land-managers, &c.** The requisite acquirements which are proper and essential to them in order to the due and full performance of all the different forts of business in which they may be engaged or employed. In this view, a considerable knowledge of the principles and practices of different forts of farming and farm-management, some acquaintance and experience in surveying land, in mechanics, in rural architecture, and in the business of planting; are indispensably necessary, as well as a notion of the various mineral and other substances contained in the bowels of the earth, and a ready facility in arranging the management of different forts of accounts.

They should at the same time possess mild, conciliatory dispositions, exact upright principles, and strict moral character. See Land-Recever, Land-Steward, and Office of Bailiff.

The duties and uses of these forts of managers, besides those of regulating and directing the husbandry, management, and other matters, are, the preventing all forts of encroachments from taking place; the seeing that a proper and right method of flocking is pursued on the commonable lands; the guarding against the turf or foil being injured by being broken up or pared off; the looking after the public and private roads, lanes, and driveways, to see that the fences on the sides of them are properly cut and pruned as occasion may require, the travellable parts of them kep: free from obstructions, and in a suitable state of repair, and that the farm-ways are well calculated to the ufe and intentions for which they were designed; the duly attending to the open drains, water courses, and common ditches, to take care that they are kept clear and free at all times, without doing injury to any one; the considering the state of the natural streams and running waters as fit for the purposes of watering live flock at home or in other places, those of irrigating land, the turning of mills, &c.; the examining the borders of rivers, brooks, &c. to see that they are not carried away, or their courses altered in any injurious manner; the taking care of plantations, and all forts of woodlands, as well as timber-trees and young plants, by seeing that they are preferred in a proper manner, and no damages committed by cutting them down, or in any other ways; the attending to the situation of the fences, gateways, &c. to see that the live hedges, with their banks, be duly cut, weeded, pruned, and kept up, as well as the gates, dikes, pales, and other dead fences properly preferred and in repair; the keeping the barn buildings, farm cottages, and garden grounds, belonging to them, in proper condition, with their tenants in a full state of industry; and lastly, the regulating the order of the different occupiers, by preventing improper meetings of all kinds, the reprefing of bad houses, and all forts of irregularities that have a tendency to lessen industry and frugality.

Besides these, there are many other duties which properly belong to them, but which need not be mentioned in this place. See Bailiff.

**Qualifications of Tenants,** the necessary properties and circumstances which render them fit for holding lands as farms. The importance of having persons perfectly qualified as tenants, is very great, in the superintendence and management of all landed property, being, in a great measure, the basis, or principal bearing, on which its uniform and lasting prosperity depends.

The proper qualifications of a good tenant, according to the author of the "Treatise on Landed Property," are the having capital, skill, industry, and character. And he contends, that without a sufficient capital, the rest are unavailing; but that, at the same time, an industrious, frugal, good farmer will thrive with difficulties, and get on with less money than a man of contrary qualifications. But if he has not sufficient strength to work his land, nor a sufficiency of live-flock to raise manure, or money whereby to purchase it, he must, under ordinary circumstances, live in a state of poverty and hard labour; and, on the first attack of misfortunes, or the first failure of season of crops, he will probably sink.
Further, that in regard to the proper ratio or proportion between the rent and capital, it depends on the existing state and circumstances of the farms, and the style of management in which they are intended to be conducted; as well as on the number and strength of the occupiers' families, and their industry and frugality. However, in order to afford some general notions on the matter, it may be said that, for farms of size, as those of from one to five hundred pounds a year, the occupiers should have at their commands from five hundred to a thousand pounds of capital, for every hundred pounds of rent which they may pay. Yet still, on the greater number of farms, the first proportion is too small to manage them with full advantage and profit. And, if they be farmed with spirit, and the higher order of improvements be attempted, particularly the introduction of the best breeds of live-stock adopted by modern farmers, the last will not be found too large for the purpose.

It may be remarked, that it is constantly the belt way for tenants to farm somewhat within their capitals, as a few pounds kept in their pockets enables them to embrace and take the advantage of every favourable opportunity that may offer, and to sell or buy with the greatest benefit. While such as are straightened for money, are forced to take the chance of markets, and liable to make bargains of a loosing and disadvantageous nature, as well as experience many other inconveniences of different kinds.

Notwithstanding, where there is a want of sufficient experience and skill in the art, and different branches of practical husbandry, tenants cannot farm or manage their lands with the most profit, either to themselves, or the proprietors of them. Where, however, their capitals and exertions are great, they may, by observation and practice, acquire skill; and by this means be enabled to perform the business in a tolerable manner, and in some measure do justice to their farms, whatever they may do for their families in the way of getting money for their benefit. But where, with a want of skill, scanty capitals are joined, it is not all the exertion, industry, and frugality in the power of man, that can save or prefer the families or the farms from injury and inconvenience.

However, without industry, capital and skill may be said to be thrown away. In the management of rural business, in which so much depends on the nature of seasons and weather, idleness is a vice of the darkest cast. Every instance of negligence is not only injurious in itself, but operates as a dangerous and had example; serving as an apology or excuse for the half indolent, with whom every farm or estate is incumbered in a greater or less degree.

In consequence of the intimate connection which necessarily subsists between the proprietors and the occupiers of land, and seeing how advantageous and profitable it is to prefer good order and regularity upon farm lands, as giving thereby full liberty and freedom to the exertions of their tenantry, it becomes a matter of some importance, in the selection of farm-tenants, to make proper and necessary inquiries into their characters for morality, and particularly as they relate to habits of sobriety or extravagance, as well as to a peacefulness or queruloseness of disposition.

And it is farther to be remarked, in respect to the proper selection of tenants for farms, that nothing of interest, or any other consideration whatever, that is not intimately connected with the above qualifications, can properly warrant the choice; unless in particular cases and circumstances, as in providing for the widows and orphans of deceased tenants, &c. A farm-manager should not suffer himself to be influenced by any sort of family connection, favour, fee, or reward. Superintendents of this kind, merely as such, cannot have any true interests separate and distinct from those of the farms or lands they may overlook. It, therefore, becomes a dishonourd act in any agent of this sort, to put an inferior tenant into the possession of a farm, through his own interest, even at a fair rent for the same.

Lastly, it may be noticed, that in a district which stands forward in a prominent manner in the ranks of rural improvements, merit should be looked for and encouraged near home. But to advance or bring up a farm or estate which remains in the rear of modern practices, two or more tenants of the higher classes should be sought for, at a distance, in such districts as are of a kindred nature, but in which the more modern and profitable management of farming prevails, in order to lead and direct the native tenantry of the situation.

These are some of the principal and leading qualifications which ought in all cases to direct and regulate the choice of farm-tenants; there are, however, many others which should have an influence in certain circumstances, and particular methods of farm-management, otherwise the full interests and advantages of the proprietors of the lands may be overlooked and neglected.

QUALIFICATOR, in the Canon Law, a divine appointed to qualify, or declare the quality of, a proposition brought before an ecclesiastical tribunal; chiefly before the inquisition.

The qualicators of the office are not judges; they only give their sentiments on the propositions presented to them. They are the inquirers that judge.

QUALITY, Qualitas, that affection of a thing, whence it is denominated such; or that which occasions a thing to affect our fenses in this or that manner, and gives it this or that denomination. Accordingly quality is said to be an attribute, from which no sublimate is exempt. See Mode.

Thus, that power in fire, whatever it be, by which it excites in us the sensation of heat, since it is that whence the fire is denominated hot, is called the quality of fire.

The word quality, qualitas, is said to have been first introduced into the Latin by Cicero; till his time the Romans studiously avoided using a term which denoted an abstract; and the only of it only considered concrete, signified by quale. The like is observed of the ancient Greeks, who did not use conceptus, but conceptum.

Quality, it is to be observed, is an ambiguous term; and has been applied to some things which ought rather to have been looked upon as states of matter, or assemblages of several qualities; as life, health, beauty, &c.

There are, also, other attributes, as size, shape, motion, and rel, usually reckoned among qualities, which might more conveniently be ranked among the primary modes of the parts of matter; since, from these simple attributes, all the qualities are derived.

The ancient school-philosophers distinguish quality in the general, which they call metaphysical and predicamental quality, into essential and accidental. The moderns more usually divide it into spiritual and corporeal.

Qualities, Spiritual, or Qualities of the Soul, are affections of the mind, considered as in this or that habitude or disposition. Of these they make two kinds; the one belonging to the understanding, the other to the will; of the former kind are knowledge, opinion, certainty, doubting, &c. Of the latter are all the moral virtuous and vices.
QUALITIES, *Corporal* or *Physical*, are what we chiefly consider under this denomination, and to which the definition above laid down is accommodated.

Philosophers are divided as to the nature of these qualities, or what they are in the body. The general language of the Peripatetic school is, that they are things distinct from the bodies themselves; and are superadded to them, or flow from their substantial forms: on which principle, they hold qualities to be real, and denominate them *accidents*; supposing them to be inherent in substances, though not in the relation of parts, but to be fullained by them as in a subject, and incapable of subsisting without them. In effect, the Thomists define qualities to be accidents following or arising from the form; in the same manner as quality is an accident following or arising from the substance.

The moderns absolutely explode the notion of qualities distinct from the body; and insist, that the powers by which bodies exist in us the ideas of such qualities, are no other than the mechanical affections of the bodies themselves, e.g. the figure, magnitude, motion, &c. of the parts of which they consist.

The principal considerations inquired on by the retainers to real qualities are, that these powers may be actually separated from the substances they inher in; as we see in light, heat, &c. That from these very qualities, considered as so many determinations, there arises a very great diversity in bodies; and that bodies, according to the diversity of their qualities, affect our senses very differently.

The adherents to the experimental way, on the contrary, account for all the qualities of bodies from mechanical causes. Thus all the phenomena of a clock, the motion of its wheels, its hands, &c., by which it strikes the hour, points the minute; day, moon’s age, &c. do all evidently arise from the single spring; which we never imagine to have any particular powers by which it should be enabled to make such discoveries; nor any other principle but that of elasticity.

Why, then, may we not conceive, as to sensible qualities, that though, by virtue of a certain congruity or incongruity in point of figure, texture, or other mechanical properties, the portions of matter they modify are enabled to produce various effects, on account of which the bodies are said to be endowed with qualities; yet these are not, in the bodies endowed therewith, any real or distinct entities, or differing from the matter itself of such a determinate being, shape, and other mechanical modifications? Thus, though the modern goldsmiths and refiners reckon it among the most distinguished qualities of gold that it is diffusible in aqua regia, whilst aqua fortis will not work upon it; yet these attributes are not in the gold any thing distinct from its peculiar texture; nor is the gold we have now of any other nature than it was in Pliny’s time, when aqua fortis and aqua regia were unknown.

We all know that the sun hath a power to harden clay, soften wax, melt butter, thaw ice, turn water into vapour, make air expand itself in weather-glasses, contribute to blanch linen, render the white skin of the face swarthy, and mowed grass yellow, ripen fruit, hatch the eggs of insects, caterpillars, &c. and perform many other things, none of which seem contrary to others; yet these are not distinct powers, or faculties in the sun, but only the production of its heat, diffusified by the different textures of the body it chances to work on, and the condition of the other substances concerned in the operation. And, therefore, whether or not the sun, in some cases, has any influence at all distinct from its light and heat, we see that all the phenomena mentioned are producible by the heat of common

fire, duly applied and regulated. Some of the ancients, and particularly the Peripatetics, have distinguished qualities into *sensible* and *insensible*.

QUALITIES, *Sensible*, or *Manifold*, are those arising from certain modifications of matter, and which become immediately the objects of our senses. Such are all those above-mentioned.

Though, in strictness, those only are said to be sensible qualities which affect some one sense alone; as colour does the eye, sound the ear, &c.

These are sometimes also, called *tangible* qualities, because they only produce their effect, i.e. excite their idea in us, when contiguous, or in contact with the organ.

QUALITIES, *Sublimate*, are certain latent powers arising from the specific forms of things, of which no rational solution can be given on any principles of physics.

Sensible qualities are usually subdivided into *primary* and *secondary*. See Ideas.

QUALITIES, *Primary*, or *General*, are such as are found in all bodies; or which agree to all matter, considered as matter, and therefore to the elements themselves. Such are extension, figure, motion, heat, solidity, impermeability, and number.

QUALITIES, *Secondary*, or *Particular*, are such as result from a composition or mixture of elements, and do not agree to body as body, but as a mixt. Such are light, heat, cold, colour, found, taste, smell, hardness, softness, fluidity, firmness, roughness, smoothness, opacity, transparency, &c.

According to Aristotle, and the Peripatetics, the primary, or elementary qualities, are those of the four elements themselves; viz., heat, cold, moisture, and dryness.

The secondary qualities, according to the same, are all the remaining; which are combinations or assemblages of the former elements; as colour, odour, taste, &c.

To give an idea of Aristotle’s method of accounting for these secondary qualities from these primary ones, we shall indulge in his account of colour. All colours, then, says he, are generated of a mixture of the four elementary qualities: white, e.g., is produced when the humidity mounts the heat, as in old men, whose hair grows grey; black is produced when the humidity dries off, as in walls, ciphers, &c. red, &c.

Among the school-philosophers we meet with other divisions of qualities; as *active*, and *passive*; and *real*, and *intentional*.

**Qualities, Active**, are those by virtue of which effects and operations are actually produced on other bodies duly disposed with respect to them. Such are the heat of fire, the moisture of water, &c.

**Qualities, Passive**, are those by which bodies are disposed to receive the action of others. Such are inflammability in oil, &c.

**Qualities, Real**, are those which remain in the subject, and only act on things adjacent to it. As fire in a piece of iron not ignited, &c.

**Qualities, Intentional**, are those which issue from the subject, and operate at a distance. Such is the light emitted from the sun, &c.

But the moderns are agreed, that either all qualities are real, or all alike intentional. So that the distinction is imperceptible. See on the subject of quality, its various species, and its different properties, Harris’s Philosophical Arrangements, chap. viii.

However ignorant we may be of the nature of qualities, or of the manner of their operation, yet we know the laws of their intention and result. Dr. Keil demonstrates, that every quality which is propagated in a medium, such as light,
light, heat, cold, odour, &c. has its efficacy increased, or abated, in a duplicate ratio of the distances from the centre of radiation, or exertion of the quality, reciprocally.

Thus, let $A$ (Plate XII. Geometry, fig. 1.) be a centre from whence any quality exerts itself round about, according to the right lines, $A_c$, $A_f$, &c. The efficacy of the quality be it heat, cold, odour, &c. will be $(at \text{equal distances from } A)$ as the $sp$uititude or density of the rays, $A_b$, $A_c$, $A_d$. But the rays within the inner circle, or rather spherical supericies, $b c d H$, when they come to be extended to the other spherical surface, $e f g K$, will be much less close than they were before, and that in the reciprocal proportion of the spaces they take up; that is, if the outer surface be the double of the inner, the rays there will be but half as thick; but since spherical supericies are as the squares of their radii, therefore the efficacy of the quality in the inner surface will be to that of the outer, as $A e$ square to $A b$ square. Q. E. D.

Sir Isaac Newton lays it down as one of the rules of philosophizing, that those qualities of bodies which are incapable of being intended and remitted, and which are found to obtain in all bodies in which the experiment could ever be tried, are to be esteemed universal qualities of all bodies. See Philosophizing.

Qualities, Cognitive. See Cosmical Qualities.

Qualities is also used for a kind of title, or degree of eminence given to certain persons, in regard to their territories, figuriaries, or other pretensions.

Thus the king of Great Britain used to take the quality of king of France; the king of Poland that of king of Sweden; the king of Sardinia that of king of Cyprus and Jerusalem; the czars of Russia, and kings of Spain, have the whole pages of qualities. The emperor of China affirms the quality of son of the sun.

Quality of Curvature. In Geometry, is used to signify its form, as it is more or less inequal, or as it is varied more or less in its progress through different parts of the curve. Newton's Meth. of Flux. and Inf. Ser. p. 75. Maclaur. Flux. art. 369. See Curve.

Qualities of Trees, and Plants. In Agriculture and Gardening, are the properties which are peculiar to them, in relation to their magnitude, modes of growth, textures or consistencies, forms, colours, tastes, smells, means of propagation, culture, uses, and values.

In regard to the fir, as soon as the simple constituent fibres of plants are evolved and increased, as far as the nature of them and the arrangement of the primary nutritive substances will permit, they cease to receive any more for their further increase; the primary matters merely replacing the inos which is occasioned by the performance of the natural functions of the plants; consequently they have each a particular prescribed increase or measure of growth. Some are very large, others extremely small. The Indian fig, in consequence of ramifications being sent off, which connect with the primitive trunk, by innumerably degrees acquires a very considerable bulk or thickness, being frequently twenty, or even thirty cubic feet in its diametrical section. And there are accounts given of particular plants, which are scarcely visible to the naked eye; and of some trees, which are so large as to cover with their branches two hundred persons, or more.

In this country, some trees and shrubs of the ornamental fort are either very high, or very low; of the former kind are the horfe-chefnut, larch, cornelian cherry, snowdrop-tree, and many others; and of the latter, the mountain-ah, hemlock, fir, Scotch rofe, butchers' broom, and many more. There are some trees which are very broad, in proportion to their height, as the oak, Spanish chefnut, &c.; others which are very narrow, as the larch, spruce fir, &c.

And there are still some others, in which there is a medium between these extremes, preferred and kept up, as in the ash-leaved maple, the evergreen oak, the Virginian rasperry, the Guelder rose, and a number of others.

The modes or habits of growth in trees and shrubs are also extremely different; some finding out their branches in a horizontal manner, as in the oak; in others they have an upward direction, as in the Huntingdon willow; while in a few they fall downwards, as in the lince, acacia, and others. Again, there are some which have an oblique inclination, as may be seen in the Scotch fir; or they recline, and then rise up again, as in the larch kind; and there are still others, in which they hang directly downwards, as in the weeping ash, weeping willow, &c.

There are likewise some shrubby plants, which creep along the surface of the ground, as the periwinkle; others which clasp themselves to trees, as the passion-flower; and a few which fix and attach themselves to buildings, walls, &c. as the ivy. Farther, there are some trees that, in whatever way they may be placed, cut, or pruned, constantly allume and take on one principal item, from which all the different branches proceed or go off, as rays from a centre, as in the fir tribe; while in others, the trunks divide themselves into arms, or large branches, which fend out boughs or smaller branches in an irregular manner, as in the oak and others. Some kinds of shrubs have merely one single item, as the althea; while other forts invariably spread and extend along the surface of the ground, throwing or leaping out a greater number, as the hypericum, and some others.

The texture or consistence of plants of different kinds is likewise very different, as hard, soft, membranous, carious, smooth, downy, thorny, &c. which are molly obvious to the feel. Plants of the young kind are commonly mucilaginous, becoming hard as they advance in growth; though many luxuriate in the date of continual softness, as the trebella; yet some are so hard as to sink in water, as the iron wood of the island of Ceylon, &c.

Thus among trees and shrubs, some have a soft smooth appearance, as the lime, the corporon fenna, &c.; while others have a hard, rough, firm appearance, as the evergreen oak, the holly, &c. There are some also which have a smooth, silky appearance, as the tamarisk, &c.; while others have a downy, woolly appearance, as the hoary poplar, &c. And some appear wholly beft and covered with thorns or prickles, as the furze, hedgehog holly, &c.; while others, again, appear wholly composed of thready fhoots, as the Portuguese broot, &c. Besides these, there are many other forts, which fur- nish different appearances from any of thefe.

The forms in the different forts and varieties are still equally, if not more, various; some being apparently solid and compact, from being thick fet with branches and foliage, as in the horfe-chefnut, the Englifh elm, the lilac, the syringa, &c.; while others are of a more light, airy, elegant form, being thin of boughs, branches, and leaves, as the alh, the hoary poplar, the bird cherry, the Canadian mepilus, &c.; and there is a middle degree between these extremes, in the broad-leaved euonymus, the alh-leaved maple, and some others. They may also be further distinguish'd into those whose branches begin from nearly the surface of the ground, as in the fir tribe of trees, and most shrubs; and into those which shoot up into a stem before their branches are begun to be fent off, as in the mountain-ah, the althea frutex, &c. It may likewise be noticed in respect to those whose branches begin from the ground, that some of them ride in an elegant cone, as the larch, the

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holly,
holly, &c.; others in a cone, whose base is very broad, as in the cedar; or whose base is very small, as in the upright cypresses. There are some which swell out in the middle of their growth, and diminish or contract at both ends, as in the Weymouth pine, &c.; while others are broadest at the top, as in the raspberry, the alpine honeyuckle, &c.; and some few irregular and bushy throughout, as in the evergreen oak, the snowball tree, &c. Among those which shoot up into a stem before their branches are fent off, there are some which are in the shape of slender cones, as in the deciduous cypresses; others in those of broad cones, as in the balsam poplar. Still others assume a globular form, as in the mountain-ash; while many are irregular throughout, as in the Scotch elm, the acacia, and several others.

As to colour, it appears to depend upon the colouring principle, the proportion of vital air and light which is contained, and is proper to different parts of the same tree or plant: hence, when exhalation is prevented, and light intercepted, the green colour is changed into white. In trees and shrubs it is either accidental or permanent: the latter including all the different shades of green in the summer months; the former, the different tints of red and yellow, which are peculiar to the autumnal and vernal seasons.

There are some of the permanent kinds of colour, which are of a dark green, as those in the horse-chestnut, the yew, &c.; while others are of a light green, as those in the ash, the common laurel, &c.; and others, again, which are of a blueish-green, as those in the Scotch fir, the bladder fenna, &c. Some trees have a green tinged with brown, as the Virginian cedar; others a green tinged with white, as the abelone and the Lapland willow. Also, in some trees the greens are tinged with yellow, as in the ashen-leaved maple, the Chinese Arbor vitae, &c.; in others with red, as in the scarlet maple, &c.; and in a few with purple, as in the purple beech. There are some greens which are spotted with white, yellow, and red, as in the variegated holly, privet, fycamore, box, and various others. The colours which arise from accident are almost infinite in number, each kind of which is liable to great variation; moly, however, it will be found that in autumn the wild cherry assumes a bright red, the birch a deep red, the beech a brownish-red, the scarlet oak a deep scarlet, the hornbeam a dull colour, the sugar maple a rich yellow, the common oak a reddish-yellow, the lime and ash a straw colour, the balsam poplar a black, the fycamore a dark brown, and others different forts of other colours.

In regard to taste and smell, the former depends upon the different principles which compose and constitute the juices or humours of the different kinds, and varies as well in the different sorts, as in the different parts of the same sort of trees or plants. The latter depends upon the volatile principle, or principles, which issue or exhalate from them, and differs in its nature, according to the kinds of plants, or the parts of them, in which it chiefly resides or is present. There are some trees and shrubs which have scarcely any smell, as the evergreen oak, platanus, &c.; others have a most grateful rich fragrance, as the birch, sweet-briar, honeyuckle, &c.; some again have a pungent, powerful smell, as the mezereon, the lirysinga, &c.; others a disagreeable nauseous smell, as the elder, &c.; in fome the smell is very sweet, as in the flowering limes; in others it is deleterious, as in those of the walnut, the art-misia, &c. There is also the greatest fragrance in some while they are in blossom, as in the hawthorn, and in some it is solely confined to it, as in the lilac; while in others it is equally diffused over or throughout the whole plant, as in the sweet-briar, and many others.

There may be considered as some of the most general characteristic qualities of trees and shrubs; but various other peculiarities incident to them present themselves, on a more minute investigation, which equally interest and deserve the attention of the ornamental planter and gardener, as well as the cultivator of all sorts of wood and timber; and which principally relate to differences in the barks, the buds, the leaves, the flowers, and the fruits. The appearance of the bark is very different in many different sorts of trees and shrubs, as red, white, black, brown, and green, as in the dogwood, birch, oak, Guelder rose, and holly. It differs also in its properties, as in some it is firm, in others spongy, in some thin, in others thick, brittle, glutinous, or thready, as in the oak, the cork-tree, the beech, the Scotch fir, the hornbeam, the holly, the lime, and the elm. It varies likewise in its duration, the outer bark or coat in some trees being thrown off annually, as in the arbutus, the Birch, &c.; while in others, for the most part, it is constantly retained or kept on. It differs equally in respect to its properties of taste, being in some alluring in its nature, in others sweet, bitter, pungent, &c., as in the oak and bramble, lime, abelone, fir, &c. In regard to buds, some trees have none at all, as the pine and evergreen forts; in some they are very large, in others very small, as in the horse-chestnut, and the willow. In some they are coated over with a covering of glutinous or resinous matter, as the horse-chestnut, &c.; in others they are overspread with a dry film or tegument, as in the beech, &c. There are likewise some buds which are of a red colour; others which are yellow, black, brown, or red and greenish; as in those in the lime, the willow, the ash, the beech, and the common fycamore, in the order in which they occur.

The variety in the leaves is still much greater: some being very broad, as those of the common laurel; others very narrow, as those of the larch. And there is a medium between these extremes, in those of the willow and the alder. In some they are entire, as in the bay; in others serrated, as in the cherry; and pinnatifid, as in the acacia, &c. In some again they are covered with down, as in the sea buckthorn; in others with wool, as in the hoary poplar; with prickles, as in the holly; with a glutinous matter, as in the gum ciftus, &c. They are of all the different shades of green in the summer season; and of all the different tints of red and yellow, in the autumnal and vernal seafons.

There are some which retain their leaves and colours during or throughout the whole year, as the pine tribe, &c.; others which lose their green colour in the autumn; but retain their leaves all the winter, as the beech, hornbeam, &c. in particular circumstances. A great number of trees, among which are the elm and the ash, drop their leaves in the autumn, and are naked all the winter. In general, the leaves have the same properties as the barks, but in a fainter and less perfect degree; which are of much importance in some points of view. Those of the elder, the box, &c. are refused by most sorts of cattle; those of the elm, the horn, &c. greedily devoured by them; while those of the fir tribe are offensive to many sorts of insects, which are liable to inflict hot-house, and other similar places.

And the flowers are much less various than the leaves. Thofe of some trees being large and showy, as of the rose, the honeyuckle, &c.; while thofe of others are small and obscure, as of the alaternus, &c. In some they cover the whole plant, and quickly fade away, as thofe of the hawthorn; while in others they are but thinly distributed, yet continue a considerable length of time, as thofe of the passion-flower, &c. There are some, which come into blossom at an early period, as thofe of the mezereon, almond, &c.;
and various other deciduous kinds; however, a year or more before their removal is to take place, they should have their roots cut in, and their tops thinned by the pruning knife, or other means, as such precautions are highly important and necessary, and should never be omitted, in removing trees of the latter of the above heights.

In respect to the uses of trees and shrubby plants, though the latter fort are commonly set out for the purpose of ornament, variety, &c., and the former for that of timber, as well as thefe and other uses; there are still some other ways in which they occasionally contribute, and become of utility and importance to the planter. There are different products of some of them, which are useful in different arts and professions. For instance, the bark of some is useful in chemistry, for the making of bird-lime, as that of the holly; that of others, as of the lime, the elm, &c. for the manufacturers of mats. The leaves of some, as those of the mulberry, for the growers and reapers of silk. The blossoms of others, as those of the rose, for the apothecary, and those of the syringa for the confectioner. Those parts of the leaves of the beech which are proper, are converted into bread. And the fruits of others, as those of the apple, plum, &c. are of very general utility and value. Some kinds of wood are of particular use and value for particular purposes, as the oak to ship-builders; and others might be trained for this application, as the larch, by bending down the stem when about twenty feet in height, securing it in that position, and then re-bending it again some considerable
able time afterwards, leaving the bole or trunk in a differently crooked state. The woody parts of the fir and pine are employed by house-carpenters, of the crab-tree by millwrights, of the ash by ploughwrights, of the beech, the walnut, the cherry, the plum, the box, the holly, the yew, and others, by the cabinet-makers. The lime is particularly useful to the carver, the fycamore to the turner, the box and holly to the mathematical instrument-maker, and the alder and the birch to the painter and the wheelmaker. Charcoal of any of the kinds is valuable for the iron-founders; that of the dogwood, fallow, elder, hazel, &c. for the gunpowder manufacturers. The larch, the silver fir, &c. afford the coarse turpentine and its spirit; the spruce and pine tribes, resin, tar, pitch, lampblack, &c. Most woods, but especially the beech, ash, elm, &c. afford potash. The sap-juice of some trees, as the birch, &c. yields a valuable liquor; and that of others, as of the sugar-maple, &c. affords sugar.

The value of wood as timber, and for other purposes, differs much according to local situation, and other circumstances; when near a dry-dock or shipyard, oak, elms, &c. suited to ship-building, are of much higher value than when at a great distance in the country. The under-growths of several sorts of trees, as dogwood, fallow, willow, alder, &c. are of the most value when near large manufactories of gunpowder, being of little utility, except as fuel, when at a distance. Some sorts of wood, however, from the generality of their application and employment, are of great value in all situations, as those of the oak, the elm, the ash, the beech, and perhaps the larch has still more value than any of them. Others, on account of their scarcity, are also valuable in all places, as the box, the holly, the yew, &c. All the lighter products of some sorts of trees, as those of bird-lime, potash, turpentine, tar, pitch, &c. may likewise be considered of equal value in all situations. But a tree which would be of the greatest value in a particular situation or place, may not find in it that sort of soil that is suitable to its nature or habits of growth; in which circumstances that which will come to the most perfection in it, will commonly be found of the most value. Such woods as may not be valuable in consequence of local circumstances, may be rendered a great deal more high in their value, by having them manufactured in the places where they are grown with, thus lessening the expenses of conveyance, &c. In consequence of the great improvements in roads, canals, &c. and the general promotion of them, woods and plantations for timber, maple, in almost all places, be valuable, and there can be few in which the other sorts of products will not be of great importance. In the measuring of standard trees for the purpose of ascertaining their value, though many think themselves fully qualified by being only able to measure them; it is only by the perfect knowledge of the use and application of the different shapes, boughs, and woods of them, that a correct estimate can be given; as a small portion of wood may be of little consequence in one sort of business, while it is of much in another, which is a secret of great interest and importance to the purchasers of timber of the standing kind.

In addition to these qualities, almost every tree and plant is possessed of various others, which excite emotions that have a relation to them, and which give their characters or expressions. For instance, the cypress is of a regular, invariable shape, or form, and always, in colour, of a dark green, having a full, foliose appearance; hence it has acquired the character of melancholy. A familiar, but somewhat fainter, train of emotions, is produced in the mind by the falling branches, dropping spray, and yellow greenish colour of the weeping willow; hence it suits with fenes of solitude, and induces meditation. In the light, airy form of the ash, and the bright white of the variegated holly, there are some traits of certain degrees of the cheerful kind; in the foliose of the virgin'sbower, eafe and gracefulness; in the myrtle, delicacy and neatness; and in the sweep of the stem, the curve of the branches, &c. of the larch, a peculiar elegance.

In the oak and the chestnut are forms which have long given the appearance of grandeur and nobility. Both these and other trees are particularly expressive of peculiar known characters, arising, in some degree, from their own nature, and in part from associations in the mind. Those of the cypresses and yews have been planted in burying grounds, and other similar places; the weeping willow, as the shade of urns; the laurel used as the crown of warriors; and the chestnut introduced in landscapes. Some accidental characters and expressions of plants are produced by novelty and singularity, either in their nature, forms, or appearances; hence exotics are at first distinguished from those of the indigenous kind, and called beautiful, elegant, fanciful, strange, rare, &c. according to circumstances. The creeping ash, the flone pine, &c. derive and retain their characters from their comparative scarcity and unusual shape; while others have that of elegance and novelty in a much less degree, as the cedar of Libanus and the cypresses; the hemlock spruce, and the scarlet oak, &c. Some trees and plants are common, and thought nothing of in one district or country, while, in others, they are uncommon, and thought highly of; thus, the weeping willow, the narrow-leaved elm, the acacia, &c., which abound, and are little valued, in the southern parts of the island; are scarce, highly esteemed, and termed elegant in those of the north; while the arbutus, the uva urb., the erica alba, and even the mountain-ash, which are plentiful, unnoticed, and common in the north, are held in estimation, and thought highly elegant in the south.

There are some of the more particular qualities of trees and plants, which are concerned in the classification and arrangement of them, as the materials by which the objects of planting and ornamental gardening are to be accomplished, but there are others which are peculiar to them in other points of view, that it is quite unnecessaiy to notice in this place, as they are fully explained in speaking of them individually under their proper heads.

More ample information on the above subject may, however, be obtained by consulting Mr. Loudon's work "On Forming, Improving, and Managing Country Residences," in which will be seen their particular utility, and their most appropriate modes of application in the business of planting and ornamenting different kinds of pleasure grounds, under all the various circumstances which may occur in so far as their nature, situation, soil, and other familiar particulars are concerned, as well as the picturesque effect which will be produced.

Qualities of Seeds, Sets, and Produce, the properties which are essential to them for the production of full and beneficial crops of the several different kinds, and the most perfect and advantageous states of growth and maturation of such crops, for their being consumed, either as food or otherwise. In all sorts of seeds of the grain kind, those which are the most fully bodied, bright, thinnell in the skin, and the most found, without being too long kept, are the most suitable for making use of as seed. Such as are small, lean, ill fed, and thrunk in their skins, or which have been in any way heated in the mow or stack, are wholly quite improper for this purpose. Some have, however, supposed the contrary to be the case, but they have hitherto added no proofs whatever, of the fact, while the former opinion is supported.
supported by the daily experience of the belt farmers in the country. There is another circumstance which is of some importance in this business, which is that of the grain for this use being constantly newly threshed out from the straw, as such, for the most part, sprouts and grows more expeditiously, and is less liable to rot and perish in unfavourable seasons and situations.

All sorts of disused grain, and such as is not perfectly free from the mixture of the seeds of weeds with it, should always be, as much as possible, avoided in this intention.

In regard to the smaller sorts of feeds for raising all kinds of plant-crops in the field, as well as those of the grasses, both natural and artificial, the principal necessary qualities, in each, are those of their being of a bright, lively, shining colour, perfectly found, and fresh, or lately collected from the plants. Such as are old, or kept more than a few months, are mostly improper for this application. The best sorts commonly slide freely over each other, without sticking or being heavy in the hand, and have a brilliant bloomy appearance.

In gardening, most sorts of feeds also are the best, and require to have these properties and qualities as much as possible; but there are a few which are apt to grow too luxuriantly for fruiting well, as some of the cucumber, melon, kidney-bean, and other kinds, which are better for being kept for some length of time, as this property is thereby in some measure corrected and restrained. Most sorts of nuts and stones, when used as feed, should, however, be employed in as fresh a state as possible.

Sets are different in their nature, being of the root or plant kinds. In the former, the sets or cuttings should have the eyes or buds in a perfect state, and be of a middling fixe, as both those which are very large and very small are objectionable. This is the case with the potato, and some other sorts. In the latter, the plants should not have too large growths, but be in a fine young state of vegetation, so that they can be set out with facility, and readily take root again, having their heads or upper parts, for the production of the produce, wholly in an uninjured condition. They should also be quite newly drawn up, cut or nipped from the stalks of the old plants, without any sort of clubbing near the roots in those which are drawn. Such as have riven the most quickly from the feed, are, in general, the best. They should none of them ever be kept any great length of time after being drawn, before they are re-planted. This is equally applicable to the field and garden kinds. See Seed, Set, and Sowing.

The produce in all the white or grain crops, which are employed either for the purpose of making or matting, should constantly be well ripened; but where the straw is to be made use of as cattle food, the crops are better to be cut before they have reached the state of full maturity, as this purpose is thereby more completely answered. There is no mistake in the produce of most sorts of field plant-crops, by taking them before they have formed their bulbs or heads in a perfect manner. But much of such like products, in the garden, are the best and most advantageously taken in such imperfect states, being tough and coarse when full grown, and without the necessary tenderness. Others require to be cut or drawn early in order to have the proper degree of sweetness and flavour. The fruit kind of produce is taken both before and when nearly ripe, according to the uses for which it is intended. Some sorts of vegetable produce are used quite in their green state, as food; while others are best in a somewhat more advanced state; and others, again, in both these states. And there are those which require to be well ripened, and kept for some length of time before they are used in this way.

All sorts of produce of the grasses-kind, are cut and used to the most benefit, when they are taken a little before they become perfectly ripe, as they go the farther, whether they are to be consumed in the green state, or in that of hay. This is equally the case with the more luxuriant artificial sorts, as with those of least growth, of the natural kind. This is explained more fully in speaking of the different plants and crops individually, and in the article Hay; which see.

QUALO, in Geography, a town on the N.E. coast of Sumatra. N. lat. 2° 45′. E. long. 99° 40′.

QUALUGA, a town of Africa, in the country of Whidah; 18 miles N.W. of Sabi.

QUAM, a town of Norway, in the diocese of Drontheim; 68 miles N. of Drontheim.

Quam diu fe bene gofferit, a clause frequent in letters patent, or grants of offices, to secure them so long as the person they are granted to shall not be guilty of abusing the same.

Thus, e.g., we find it in those given to the barons of the exchequer; where it intimates, that they shall hold the same as long as they shall behave themselves well; which is to be restrained to matters of their offices; and signifies no more than the law would have implied, had the office been granted expressly for life. See Judge.

A grant therefore, with this clause, is equivalent to a grant for life.

QUAMASH, in Botany, a name given by the North American Indians, to a plant called Phalangium Quamoso, by Mr. Pursh, in his Flora, v. 1. 226; who nevertheless mentions an irregularity in the petals, that might possibly embarrass it as a new genus. See Phalangium.

This plant was observed by governor Lewis, about the upper part of the Missouri, near the Rocky-mountains, flowering in June. The bulb is roundish, tufted. Stem none. Leaves radical, few, long, and linear, half an inch broad, smooth; keeled underneath. Flowers flaky, naked, erect, round, smooth, unbranched, a foot or more in height, terminating in a spike, or rather cluster, of large, pale-blue flowers, each accompanied by a linear, membranous, withering bract, longer than the partial spike. Petals linear-lanceolate, nearly equal in length; five of them ascending, the fifth deflexed.

The bulbs are carefully collected by the natives, and cooked between heated stones, when they assume the appearance of baked pears, and have an agreeable sweet taste. They form a great part of the winter stores of these Indians. Though governor Lewis's party found them a pleasant sort of food, they could not be eaten, in any quantity, without causing bowel complaints.

QUAMOCLIT, an Indian name, retained by Plummer and Tournefort as generic; but by Linnaeus used only as the specific appellation of a beautiful species of Ipomoea; see that article.

QUAMPEAGAN FALLS, in Geography, falls in America at the head of the tide on Newichwanaock river, which joins Piscataqua river, 10 miles from the sea; so called by the natives, because falls were there taken with nets. At these falls are a few of saw-mills and others, and also a landing-place, where great quantities of lumber are rafted. Here the river has the English name of Salmon Falls river, from the number of salmon caught there. On many places from Quampeagan to the pond, from which it issues, there are mills for boards and corn.

QUAM-TOM, a town of China, of the third rank,
in the province of Yun-nan; 15 miles N.E. of Tchou-hiong.

QUAN, a town of China, of the third rank, in Chan-tong; 22 miles W. of Tong-tchang.

QUAN, or Guan, in Ornithology. See Penelope Grifisata.

QUANAMORA, in Geography, a town of Africa, in Upper Guinea, on the banks of the Scherbro', said to contain 5000 families. N. lat. 7° 45'. W. long. 10° 15'.

QUANDROS, a name given by writers of the middle ages to a fioned to which they attribute great virtues, and which, they fay, is found in the head of a vulture.

QUANG-LING, in Geography, a town of China, of the third rank, in Chan-fi; 15 miles W.S.W. of Ouei.

QUANG-NING, a town of China, of the third rank, in Quang-tong; 35 miles N. of Tchao-king.

QUANG-PING, a city of China, of the first rank, situated in the northern part of the province of Pe-tche-li, between the provinces of Chang-tong and Ho-nan, which has nine towns of the third class dependent upon it. All its plains are well watered by rivers. Among its temples, one is dedicated to thefe men, who, as the Chifene pretend, discovered the secret of rendering themselves immortal; 212 miles S.S.W. of Peking. N. lat. 56° 47'. E. long. 113° 29'.

QUANG-PUNG, a town of China, of the third rank, in Pe-tche-li; 17 miles N.W. of Tai-ning.

QUANG-SI, a province of China, situated between thefe of Quang-tong, Hoh-quang, Koei-tcheou, Yun-nan, and the kingdom of Tong-king; about 350 miles from E. to W., and 230 from N. to S. In commerce, as well as extent, it is not equal to that of the other provinces; and yet it fo abounds with rice, as to supply, for six months in the year, the province of Quang-tong, without which the inhabitants of this province could not subsist. The mountains with which it is covered, abound with mines of gold, silver, copper, and tin, and in this province is a fingular kind of tree, containing a soft pulp, which yields a fort of flour, and of this flour they make a very good bread. Besides parroquets, hedge-hogs, and the rhinoceros, wild animals, curious birds, and uncommon insects are found here in great number. This province contains twelve towns of the fift class, and eighty of the second and third. Its capital is Quei-ling. Grofler's China, vol. i.

The population of this province is estimated by Sir George Staunton at 10,000,000; its area comprehends 79,456 square miles, or 50,851,840 acres. The revenue remitted to the imperial treasury at Peking, comprising land, fall, and taxes, is rated at 500,000 taels, or ounces of silver. The military force is fixed to amount to 50,000 men. Its capital is Canton; which fec.

QUANG-YANG, a town of China, of the third rank, in the province of Quang-fi; 30 miles S. of Tien-nan.

QUANG-YUEN, a town of China, of the third rank, in the province of Se-tchen, seated on the Kialing; 50 miles N. of Pau-king.

QUANNEFIORD, a bay on the W. coast of West Greenland. N. lat. 62° 10'. W. long. 48° 5'.

QUANO, a town of Japan, on the island of Nipphon, on the S. coast, 70 miles E. of Hakone. N. lat. 35° 58'. E. long. 136° 14'.

QUANTALLA, an island of Africa, at the mouth of the Zaire, celebrated for a filver idol, to which the neighboring kings fend presents and offer sacrifices.

QUAN-TAO, a town of China, of the third rank, in Chan-tong; 25 miles W.N.W. of Tong-tchang.

QUAN-TCHANG, a town of China, in Chan-tong; 13 miles N. of Po.

QUANTITE, Fr. This word in music, like profody, does not fix the number of notes or of syllables, but their relative duration. Quantity produces the rhythm, as accent produces intonation. Rhythm and intonation generate melody. Rouleau. See MELODY.

QUANTITY, Quantitas, any thing capable of elimation or mensuration; or, which being compared with another
other thing of the same kind, may be said to be greater or
less than it; equal, or unequal, to it.
Mathematics is the science or doctrine of quantity.
Quantity is a general attribute, applied in a very different
manner to things of very different nature; whence it is im-
possible to give any universal definition of it.
Quantity is applied both to things and to modes; and
this either spirally to one; or plural, to several. In
the first case it is called magnitude, in the latter multitude.
Quantity may be reduced to four classes; viz.
Quantity, Moral, which depends on the manners of
men, and the free determination of their wills. As the
prices and value of things; degrees of dignity and power,
good and evil, merit and demerit, rewards and punish-
ments, &c.
Quantity, National, arising from the operation of the
understanding only. Such as the largeness or narrowness of
the capacity of the mind, and its conceptions. In Logic,
universals, predicaments, &c. In Grammar, the quantity
or measure of syllables, accents, tones, &c.
Quantity, Physical, or Natural, which is of two kinds:
I. That which nature furnishes us with in matter, and its
extension. And, 2. In the powers and properties of
natural bodies: as gravity, motion, light, heat, cold, rarity,
density, &c.
Quantity, Transcendental, or duration, the continuation
of any being, existence, time, &c.
Quantity is also popularly distinguished into continued
and discrete.
Quantity, Continued, or Continuous, is when the parts
are connected together, and is commonly called magnitude.
This, again, is of two kinds; either succedanea, or improper,
atime.
Quantity, Discrete, is when the parts of which it con-
stitutes exist different, and unconnected together; which makes
what we call number or multitude.

The notion of continued quantity, and its difference
from discrete, appears to some without foundation. Mr. Machin
considers all mathematical quantity, or that for which
any symbol is put, as nothing else but number, with regard to
some measure, which is considered as one; for that we can-
not know precisely how much any thing is, but by means of
number. The notion of continued quantity, without
regard to any measure, is inexact and confused; and
though some species of such quantity, considered physically,
may be described by motion, as lines by the motion of
points, and surfaces by the motion of lines; yet the magni-
tudes, or mathematical quantities, are not made by the
motion, but by numbering according to a measure. Vide Phil.
Traf. No. 447. p. 228.

Permanent quantity is farther distinguished into length,
breadth, and depth.

Wolfius seems to give us a more precise notion of mathe-
matical quantity, and its two species of discrete and con-
tinuous. Whatever is referred to unity in the same manner
as one right line to another, is what we call quantity; or
number in general.

If, now, the thing be referred to a given unit, as 3, it
is called a determinate number; if to unity in the general,
or at large, it is called a quantity; which, on this principle,
is the same with indeterminate number.

Thus, e. g. 3, the breadth of a river is accounted a quanti-
ty; if, then, it be enquired how great it is; to conceive
its quantity, we take some unit at pleasure, and see the rela-
tion of the breadth to it; and according to the different unit aforesaid, we express the breadth of the river in a dif-
f erent determinate number.

The breadth of the river, therefore, is quantity con-
ferred as referred to a vague unit, or to unity at large; but
the unit being determinate, the thing is understood by a de-
terminate number.

In this sense, algebra is the arithmetic of quantities. See
on the subject of quantity, Harris's Philosophical Arrange-
ments, chap. ix.

Quantity of Action. See Action.
Quantity, Impossible, and Imaginary. See Root.
Quantity of Curvature at any point of a curve is deter-
mined by the circle of curvature at that point, and is reci-
procal proportionally to its radius. Newton's Meth. of
flux. and Inf. Series, p. 60. Maclaurin's Fluxions, b. i.
See Curvature and Evolute.

Quantity of Motion, in Mechanics, is of two kinds; viz.
of momentary motion, and of entire motion.

Quantity of entire motion. The Cartesians define the
entire motion as the momentary one, by the factum of the
mass, or quantity of matter, into the velocity; but since
motion is a successive being, and has not parts co-existing
together, its quantity ought to be estimated by the aggregate
of the several parts existing successively; and is therefore equal
to the factum of the moment into the time.

Quantity of momentary motion is the factum of the
velocity into the mass; or it is a measure arising from the
aggregate of the quantity of matter, and the velocity
of the motion of the body; the motion of any whole
being the sum or aggregate of the motion in all its several
parts.

Hence, in a body twice as great as another, moved
with an equal velocity, the quantity of motion is double; if
the velocity be double also, the quantity of the motion will
be quadruple. Hence, the quantity of momentary motion
coincides with what we call the momentum, or impetus of a
moving body. See Force.

In the collision of bodies, the quantity of momentary
motion, which is found by taking the sum of motions tending
the same way, or their difference, if they tend towards con-
trary parts, is not at all changed by any actions of the
bodies on one another. See Percussion.

Quantity of Matter in any body, is the product of
the density into the bulk; or a quantity arising from the joint
consideration of its magnitude and density.

As, if a body be twice as dense, and take up twice as
much space as another, it will be four times as great.
This quantity of matter is the best discoverable by the
absolute weight of bodies. See Matter.

Quantity, Infinite. See Infinite Quantity.

Quantities, in Algebra, are indeterminate numbers, or
things referred to unity in general. See Number.

Quantities are properly the subject of algebra; which
is wholly conversant in the computation of such quantities.

Crown quantities are used to be noted by the first letters
of the alphabet, a, b, c, &c. the quantities sought by the
mathematics, d, e, f, g, &c. See Characters.

Algebraical quantities are chiefly of two kinds; positive,
and negative.

Quantities, Positive, or Affirmative, are those which
are greater than nothing, and which are affected with the sign +
 prefixed; or supposed to be fo.

Quantities, Negative, or Privative, are those less than
nothing; which are affected with the sign — prefixed.

Hence, i. Since + is the sign of addition, and —
the sign of subtraction; a positive quantity is produced
by adding any real quantity to nothing: e. g. 0 + 3 = 3;
and 0 — a = — a. And a privative quantity is produced

by

A a
QUA

by subtracting any real quantity out of nothing; e. gr. 
$0 - 3 = -3$; and $0 - a = -a$.

For an illustration. Suppose when you are quite deli-
tute of money, somebody gives you a hundred pieces; you
have then a hundred pieces more than nothing; which pieces
constitute a positive quantity.

On the contrary, suppose you have no money, yet owe a
hundred pieces; you have then a hundred less than nothing;
for you must pay a hundred pieces to have just nothing.
This debt is a negative quantity.

Thus in local motion, progress may be called a positive
quantity, and regresses a negative one; because the first in-
creases, and the second diminishes the space passed over.

And in geometry, if a line drawn towards any part be
accounted an affirmative quantity; another the contrary way
will be a negative one.

Privative or negative quantities, therefore, are equally
real with positive quantities, but opposite to each other, so
as to take away each other's effect, in any operation, when
they are equal as to quantity. Thus $3 - 3 = 0$, and
$a - a = 0$. However, though $a + b$, and $a - b$, are equal as
to quantity, we do not suppose in algebra, that $a + b = a - b$;
because to infer equality in this science, they must not only
be equal as to quantity, but of the same quality, that in
every operation the one may have the same effect as the other.
A negative quantity is said to be less than nothing, becaus
it is opposite to the positive, and diminifies when joined to it;
whereas the addition of $a$ has no effect. But a negative
is to be considered no less a real quantity than a
positive. Quantities that have no sign prefixed to them
are understood to be positive. See Negative Sign.

Quantities, commensurable, compound, exponential, heter-
genous, like, rational, simple, transfinite, and variable.
See the adjectives.

Quantities, Addition of. 1. If the quantities denoted
by the same letter be affected with the same sign, the
numbers prefixed to them are added as in common arithmetic.
2. If they be affected with different signs, the addition
is changed into subtraction; and to the remainder is prefixed
the sign of the greater.
3. Quantities denoted by different letters, are added by
means of the sign $+$; as in the following example:

$$
4a + 2b - 2c - 5d - g \quad a - b
$$

$$
5a - 2b + 6c + 2d - 3g \quad c
$$

$$
9a + 4c - 3d - 4g \quad a - b + c
$$

See Addition.

Quantities, Subtraction of. See Subtraction.

Quantities, Multiplication and Division of. See Multi-
plification, and Division.

Quantities, Combination of. See Combination.

1. If a positive quantity be multiplied or divided by an-
other positive quantity, the result is also a positive quantity.
2. If a negative quantity be multiplied or divided by a
positive, the result is a negative.
3. If a negative quantity be multiplied or divided by an-
other negative, the result is a positive.
4. If a positive quantity be multiplied or divided by a
negative, the result is a negative quantity. See Multiplica-
tion, in Algebra.

Quantity of a Degree. See Degree.

Quantity of an Eclipse. See Eclipse.

Quantities of Seeds, Sets, and Plants, in Agriculture,
the proportions of each, which are necessary for raising
good crops of the different kinds. The ascertaining of
the most useful and beneficial quantities, in the several cafes,
depends, in a material degree, upon a number of different
circumstances, such as those of the situation, the nature and
quality of the soil, the period of sowing, the state of the
feason, the manner of putting them into the earth, and fe-
veral others.

A great deal more feed, sets, and plants, are requisite
in late situations or backward seasons, heavy, wet, fluff
lands, and late sowings; than where they are more forward,
more light and dry, and put in early. And far less quanti-
ties made use of in the drill and dibble methods of put-
ing in the crops, than in that of the broadcast, or by the
hand.

In most sorts of white, or grain crops, the quantities are
from two to five bushels per acre, being more in barley and
oats, than in those of the other kinds, as from three to five
in general.

In those of the pulse kinds, usually from fix or seven
pecks, to two, three and a half, and four bushels, being
commonly the latter, or more, in some sorts of beans.

In those of the small feed description, as the buck-wheat
and turnip sorts, from one to two and three pounds; but in
the cabbage kind, only from six ounces to half a pound,
and a quarter or half a peck.

In the tap-rooted crops, as the carrot, parsnip, mangle-
wort, &c. from two to five pounds, and sometimes fix.

In lettuce crops, in the field, from three to four pounds
the acre.

In different sorts of plantation crops, as those of hemp,
flax, wool, fold, teaeful, &c. from two to three up to five
or six bushels, in the three first; but only from two to four
quarters, and from one to two pecks, in the two last.

The fets in the hop, madder, loquorice, and lavender kinds,
are from fix to seven hundred, and a thousand or more,
in the first, and two half; but in the madder from fifteen
or twenty thousand per acre. In the cabbage fort, from
eight hundred to a thousand and more plants or sets to the
acre. And in the potato the quantity of sets vary from eight
to twenty or more bushels to the acre, according to
the soil and manner of their being put into the ground.

The quantities of natural grains which are generally
employed upon the acre, are from two to four bushels and
upwards. And those of the artificial grains kinds, in the
clovers from ten to eighteen pounds; in fainfoin from three
to four bushels; in lucern from sixteen to eighteen pounds;
tares from two to three bushels; trefoil, three pottles of
cleaned feed, or two bushels of the uncleaned feed. And
in chicory from eight to twelve pounds. See Seed, Set,
Plant, and Sowing.

The subject is more fully explained in speaking of the
of the different sorts of crops, and the most suitable
quantities under different circumstances put down.

Quantity, in Grammar, denotes the measure and
magnitude of the syllables; or that which determines them
to be called long, or short; or, it is the measure of time
required for the distinct pronunciation of a syllable.

This quantity is the object of prosody; and it is the re-
gard to this that distinguishes verse from prose.

The economy and arrangement of the quantities, i.e. the
distribution of long and short syllables, make what we call
the number.

The quantities are used to be distinguished among gram-
arians by the characters short and long.

The proportion between the long and short syllables may
be generally fixed the same as that between the crotchet
and quaver in music; viz. as two to one. See Time.

Syllables are long or short, either by their nature, or by
accident; that is, on account of the place where they are
put
QUANTITY.

1. Except that a short vowel before two consonants, whereof the former is a mute and the latter a liquid, is common; as

\[ \text{'All' ἐπιλέξας τόν, ἀκούσας ἅλώματος κατακάθισε.} \] Hom. 

Σάραξ. v. 45.

2. A short vowel is sometimes made long before a single consonant, particularly before a liquid, as πωλάλα ἀντίπρομε, Hom.; παραγμοί, Hom.

Note.—1. In pastoral, elegiac, and epigrammatic verse, the syllable is more frequently short.

2. In dramatic poetry we may observe, 1st, that a short vowel before a short or aspirate mute followed by a liquid, and before a middle mute followed by a, remains short. In tragedy the syllable, if not final, is often long. 2dly. A short vowel before a middle mute followed by \( \lambda \), \( \nu \), or \( \kappa \), lengthens the syllable in all dramatic poetry.

3. When the syllable is lengthened before two consonants, the vowel in pronunciation affirms one of them; as θε-α-ζη, ἀπε-δεικνύς, κτά-πά-κοις, πέτροι, τε-τοις. Hom. When the syllable remains short the vowel concludes it; as πα-περις, πε-περις.

5. A vowel before another does not suffer elision, as in Latin, at the end of a word, unless an apophtegm is suffixed.

Note.—The elision of diphthongs takes place in verbs only; real inferences of this are to be found only in the fragments of the new comedy.

6. A long vowel, or a diphthong, is generally shortened at the end, and sometimes at the beginning, of a word, before a vowel; as οἷς ἤι, Hom.; ταῖς, Soph.; ι οἷς ἤι; Theoc.

Note.—A long vowel, or a diphthong, may be considered as consisting of two short vowels. If the latter is supposed to suffer elision, the former will of course remain short; as οἷς ἤι.

Composition and Derivation.

9. Compound and derivative words follow the quantity of their primitives; as \( \text{άστικος} \) from \( \text{τυγκύς}, \) \( \text{φως} \) from \( \text{φίων} \); \( \text{λοι} \) from \( \text{λίς} \).

Note.—Grammarians have sometimes complained that "non fanno regulae indicandum". But Dr. S. Clarke affirms, "Derivantes pro eo, a quo parte sunt penultimum timenter vel perpetuo corrupi, vel perpetuo producunt. Latin habet bene, logi, quasi contrarium ex lege. Similiter sedes, sed, indeque sedes, sedula. Cum fimili quidam ratione, apud Graecos sit. Verba minima numeros, sine quibus praebiscant et imperfecti omnibus et in soribus primis, activa et mediocribus, sperant producuntur: in futuris secundis et auribus secondis omnibus, sperant corripiunt; ut φως, ἠπόμ, ἄρω, ἄρως, ἀπεδεικνύς, indeque ως, ἀφρός, φθέργε, &c. Κρής, κρίνη, κρίνη; δέκα, indeque κρίτες, κρίτης, κρίτης, &c.

A 2 2 According
;
;

QUANTITY.
Except A, the penultimate oi nouns in £i:> in*
by c, and feminine proper names in ai'f, arc
long ; as Ma^^dwy, ®ail;. Alfo in iij, 'anf, x^aa-:, >ao,-,

-the fame analogy, f^x^n^iuuty i^agT-y^o/f kv, and
always lengthen the ainepeiiuhimate ; as in Eurip.
Med. 21. 619. 1410; Ariftojili. Acharn t)l6, Niih 495, &c. though
/tafrCfot/fcxif and its derivative fia^Tv^i&^y Ihorten that tillable ; as

According to

1.

ifttterZpafinvy

A,

privative,

ii.'Afi,

^iT,'

in

i^aj

I, the penultimate of nouns in
(except comparatives) ; as $^a.y;\x-j,

The

12.
IS

(hort

Nouns end AHjedives.

Increments of

xta^w,

2.

Except nouns in ai-avo,And the Doric genitive

as ATjEiJao,

;

jjlovs-iZw)/

The

26. A,
;

1.

faid to

is

v^iai,

*e^0;,

Xtav,

%,^iov,

oii>

y^tvioy,

fVif,

Except

liom.

ETE?.?.!.

words of two terminations;

in

2.

And

monofyllables
orif , cIVp/o;

'rjii;^o: ;

65*1,

;

3.

Alfo nouns making

4.

Nouns in

or

i|, lyo-r,

as

;

as JsJ.^iv,

or

i9o;

as xvkjui;, xyn^Too-;;

;

if oivi|,

;

and

iP'^^yv-,

2.

TfiJsl'i

words of two terminations

in

with w^v^,

yf^oj

;

x,

which fometimes

^,

j,

<r,

x§«te{o»

^'

»,

"k(j?iei,

a. 25.
polylyllables in

II.

p,

>.,^

aXXi xaxu;

as

t,

i?,

x.

ptiSo--

tcri

or a vowel goes

ccto;, if ^

'A^dn;,

as anaior,

;

A

xatoT,|,

ctTE,

as ^o'^xun

;

a-rXdro;

:

;

(Se&ft;?)

^Dofux')-:

'A~vx;

xovor,

dix^uEX'tri,

xavaoivoc,

CaTE^oc, 'laVu|,

c^a-TETTis,

xajr, xa^cr,
x^arr^,

x^avoi',

STU/jt^aXor,

oi^,

common.

TaAtf, Tia^a,

cr^^ayt-:,

"l6a-

x&taXo;,

Xa^o*, vavcr,

?^ddxv,

K'^dy.o.:,

'Idtrii-i,

xoa'XE^or,

x^.ado-*,

vaTri.',

(TaTr.-^oii?,

ct:;-

^aXaiva,

Tgayr,;-,

^a^d&~

^\vd^ocy -^d^n:, u^dmaui, ddfrjc, 'Ayd-ro;,

i^dvo:,

Increment of Verbs.

aTEtfo;,

oa^o;, AcTjuGiTa;, Aat^iJv, daitc, otc^-

t'Ctyuf,

vdm'ia, ^0{jL^d\ri, wavi^a-, wET^axiiCj f'aoi|,

are

;

'dioXtcrxo:, 'axii,

iu 'dSocXi, "dyr,,

dXccvvr,, ^dua^oLKo:, 'At*;,

y£vj?i,

xjaviov,

xr^uxor.

y^J-j ynffij

long

alfo

is

axtCTiOf, *Axt;',

rrv^i-:.

Except

r^Aifxa,

j

dit.oa^o;,

as /xxo-tj*, ^iayllyo;

tx.o.; ;

2.

as tuj,

i^vfxa,,

long

;

5. Monofyllables in t^!-, '~o, ; as 9^i4-, tji-c'f.
14. The penultimate increafc, T, of nouns and adjeftives,
;

r.euter r.ouns, are

except e^xt';;.
Likewife nouns in aT»,-, whether gentiles proper, or
the names of ftones, arc ufually long
as 'ATidrv-,
cl^dtnc, 'Evl^xtr.T, \'x,yd~r,:, &c.
Alfo numerals in

Co/vIko;,

1.

-srXsc.

fxv-j:^j

//a in

7, i\ §,

13,

Except

before

Air, AVo;

are (hort.

r1;o.:,

rir,
100;

but

5if, 9lvo,- ;

^•ji'kn:,

iyv:7>:,

penultimate.

A before
moftly (hort ;

EfV^o;.

Except

(inal

xoi^a,

xXi;.<a,

27.

of nouns and adjeftives,

I,

vtaj,

Evi7w,

as bzd^Xf fjir^u^a, ^Oixci*

1.

(hort

But

accounted common ;
be common in

in >a are
1

m

Alfo

'Q^it^'y.

xiiavEo,'.

before

r,

1,

m

long

IS

iJeto',

(Iiorten the

penultimate increafc,

as

;

Y

Tiia^a',

is

is

t'^at,

i-xU-j:,

;

3.

for

are long.

CfiaJior,

13.

thefe

long,

is

o-,o;,

la.v,

'V^^^o:, -sraXiilir, ^*£^t;.

'iv^tt:,

Eikewife

as (TD^ia, xaAia.

as Tixav, Tiravof.

;

^iTa/iy.
3. Alfo, XEfaf, xi^im ; X{a;> xjxto,- ; >J.ap, 4-a^o;
f i^af , 6i^axo; ; li^a^, hfUKOc ; KOf Jaf , xofJaitoc ; vsaf , VEaxo;

fhort

Ixo^ui,

the penultimate of nouns

penuhimate increafc, A, of nouns and adjeftives

"dr.Tr.;,

as islya,;o;,

;

1.

is

antepenultimate of

'Axaixoj, 'AJove;, "Aaj^sf, ^Ktoftui, |Sb-

2.

x^icf,

Of the

the

likevvife

:

'dustru:,

&C.

7ia<ic,

hut long in ssQxvaio,-.
;
compofition, are (hort; as

(hort, as axl^o:

is

^^1,

J^i,

axpaavlof,

rife tu xJ^ios

ner, K'j^u fut xu^w, gives

araos

:^5co;-,

Antigon. 5H. In the lame manand xu^£«, &c.

in Ariftoj'h. Eccl. 5_r7, Sophocl.

10.

crcafing

vx-rrd'c^cc,

The

15.

quantity of

all

tenfes generally remains the fame,

3.

A

common in a/xa^^',
More frequently

;s

from which they are formed ; as from x^lwi.'
are formed jxpivok, Kfnofnti, iK^hojxriv ; from xpivi are formed

x§a;^i;;.

a^i^ov,

prandium,

XEXoVxa, x::<^('^ai,

yatiayti',

tavy.ynv,

as in the tenfe

The

16.

as

ipi/a.',

except

in s-th-,

wtV7i>,

f'lVIa;,

and thofe

fhorten the penultima of the perfeft.
18. In the Attic reduplication the penultima
>)^ixa,

r;i^i',

as sruirov,

:

future
in

(hort

is

mix,
;

as

Ti-rU'ra,

except

;

^!/3{!9a,

iffiya, xjxfaya,

XEXflya, uE^uxaj TTE^^aya, ^E^plxa, T;Tf*y«.

20.

The

doubtful vewels before

c-i

are long

;

as T!Tu(fair<,

;

^xr^a,

I

before

But

as

x='K>.i'0>,

but long

as 9ai/^a^<u, Sav/aariti

;

»,

vopi^i',

y

followed by

louVyii

;

xKu^k,

crx;

are (liort

ri ^a^vrff*

A ^^Cd*r>7,

Vowrh

in

the

Alfo

axJvaxus,
'EvIteuj,

xXtTEf,
XijuoT,
itriofo.',

or

Firfl

Middle

ffTibl),
ffifi-o;,

I, i»,

is

1

X,

x,

^

in

and more

:

"!,?>),

;<7-i;,

t,

«-,

moftly long

Horn.

Iim,

i»n,

itt,

w,

ju,

is

(jTi';^^^ avc^wy.

long

axovtTcv,

l\vi, "IXiO'tro?,

Syllables.

25. A,

'airaXafivo;

itu,

It.

irnf,

x>

<;,

74^*

e,

which

iroc,

as ^«i,

;

is

as B^rfr,

;

»ix>i,

adl^l TOr.

0E^(7*T-/I,',

in thefe

a/j>>i7s;,

"iJoj,

'Ayx}<n<, 'Aiyiva, ayiv/i'

:

a'/xfiuoj,

'iOiTf,

before vowels, are generally fhort

;

as 'n»>o;^oi

3.
1x511!,-,

^iftov,

J^E^flf,

Ka^ivoc, xTxa/Aoy,
xvi^o^,

xviciiT,

/xec^lda.,

^faw,

AiJii,

f»«r>i

'ixa^of, "iX»i, "iXiyJ, *IXui,

alffufo;,

(7Ti*^0J,

(fhwi,

But

1

xoyTo-aXo^,

i^aj,

xoviXji,

xoxXa/^tivof,

xujuivov,

^e^Xcv,

Tritfa^,

Sijwv, £»A*iyGc,

criyfl,

cxi-ruy,

o-^»A>),

(r^iX«t^,

TiioU^K, Ti^WVO^:, 7~ifXUU, lijCLV, Tl^Vf,

p^aXivof, ;^!Xi^wv, xi^Kii, X'^'^> X^'^^i

in thefe is

ixan-,

t^^fioc,

xXV^a^,

vjet^QtvoTr'iTric,

ci^wv,

tr't^oc,

'I.^*7o':,

xXibavo-j,

'Iva^^of,

xi;^o^ov,

caTivoy, <rEXiyoy,

7*7ufO^,

(piivii,

'ivwj

xfxi;^,

Mio^tyavoy,

nTya,

ctIXew,

cim'JxCfiOv,

Quantity of doubtful

S,

y, ^,

/9,

Except nouns

1.

'X'^?'

x\i/o-u'.

24. But «7i) is long before from verbs in aw preceded by
a vowel, or in ^-xx, as Gfav, Otacrij ; ojaiu, Jjaira). lo-ai and uc-u
are long from verbs in u pure ; as ri'i, tIj-u ; tV^"!', io-;^tiTi;.
T/^f

'a>.iaxu;,

as x^u5l.

iu dillyllables,

and

Ta'D??,

before or after

1

s-i*ba^ov,

2.

21. In the JirJ} norift participle, ao-a is long.
22. In the imperative of verbs in jjh, v is (hort in polyfylla-

23. In theJir/1 future, a,

'aXao;,

in

generally have their penultimate long

d.'txvDy;.

lables

28.
(hort.

middle follows the quantity of the fecond

Tafo?,

(hort

^aXo-a^&v, daTrEdoy, ZaxvvGofj

'aTaXX^t',

frequently long in 'afa, Saxof, ^k^oj.
4. In the nominative, a in 'AtoXXuh is fliort ; in
other cafes, common.
'An^ in the nominative is common, in other cafes long.

;

E^v5^*xa.

The perfea

19.
aorill

firft

vrs^yxa.

Ci(j!£,

Verbs

17.

sx^i5>iv.

perfea follows the quantity of the

"Ajn?, xafato,-, Ea7o;, xaJiof,

common

Xf.'r,

5

:

xo^ttoi,

'Ax^x'^iy
xoTivo;,

?(''''">

Xtlof,

"xiXof,
fiu^ixn,
isrif»fj




QUANTITY.

1. Except that αυ is long in circumflexed words, and in oxytons masculine; as σαυς, Τταυς.

2. These adverbs, ὃποιος, ἵνα διότι ομοίως: and the accusative of the first declension, whole nominative is long; as Ἀντίων, Ὀλυμπ.

3. It is long in words of two terminations; as ἀγαθός and ἀδίκος.

4. Μένων and μένων when circumflexed: τινι Dorian for σι. Πέπορ is sometimes long in Homer.

5. Nouns in αυ, αυς as ἀγαθός, lengthen w final.

6. Συνος is long in words of two terminations; as πρέσπη and πρεσπεία.

7. Accusatives from αυ long; as ἄρας, with ὃς; though ἀρας the enclitic is short; as τοι ἀρας.

8. The imperfect and second aorist of verbs in υψι; as ἰδεῖσθαι, ὕπερθεν.

9. Except that υ ψ υ ψ final is short; as ἡμείς, ἡμέρις, υπό, νός, βατάδις.

1. Except that αυ is long in the nominatives of participles; as τιλαί: in all cases of the first declension; as ἄνατος, ταμίας, μοῖρας, μοῖρας: except the Doric accusative; as ἄρας; in plural accusatives in αυ: from the long α in the accusative singular of nouns: in υυς; and in nouns in αυς: as Αιος; with ταιος.

2. Also υς is long in words of two terminations; as ἀνθρώπους and ἀνθρώπως in nouns in υς; increasing long; as ἀνθρώπης, ἀνθρώπες, &c.

3. And υς is long in words of two terminations; as ὅτιος and ὅτιοι: in monosyllables, as μός, μῶς: oxytons making the genitive in ας pure; as πλατός: ὡς is common. And in verbs in υμι; as ἢδεικνυς, &c.

On Quantity in the Latin Language.

As the proody of the Latin language is considered to form an essential part of a classical education, we shall, therefore, devote the more peculiar attention to this part of the subject. In the course of which some rules will be given on the quantity of syllables usually said to be long or short by authority; which, we believe, have never yet been collected by any writer, ancient or modern. Perhaps, therefore, in particular for this, and for such other reasons as the cœndour of impartial discernment shall discover, we shall not incur the cenure of having been too bigine, should we have indulged the hope of being enabled to offer the most complete system on Latin proody that has hitherto been presented to the public.

GENERAL RULES.

A Vowel before a Vowel.

1. One vowel preceding another, in the same word, is short; as puer, egregias.

O Melibaeus, Deus nobis haco offert. Virg.

2. The same happens, though an h intervene; as nihil, ãhenus, ãñhusco.

De nihiló nihil, in nihilum nihil posse reverti. Perfr.

Note.—H is generally considered only as a note of aspiration or breathing; though some ancient grammarians considered H as a continuant, and ranked it with the semi-vowels. See Terentianus Maurus, de syst. 511.

1. Except

31. As in, u, final are short; as α✈, ὡ 'Ανιδ, ταῦτα, εὐερα;
QUANTITY.

1. Except the i of fio is long, when it is not followed by a vowel and r; as fiam, fiam, fiam, fiat.

Omnis iam fiant, suntque poetae negebant. Ovid.

2. The e of the genitive and dative of the fifth declension, when it comes between double i, is long; as faciei; but it is short in spei, and long and short in rei et fidei.

Venenum erat ad Vestae quattuor jam parte deo. Hor.

Enhythum fractum; nee te diga fixt. Seneca.

Ipsi rei rationem redire possis. Lucret. &c.

Cursum nescio quis temer abest rei. Hor.

Ille vir haud magnus eum re, sed plenius fideli. Em.

Unum rectus habens, fideliqve immobile vinculum. Manil.

* Lucretius furnishes five examples of rei; Plautus two. These cases appear to have been anciently written both e-i and e-i, which accounts for the variation in quantity in Latin.

3. Genitives in ius have the i long in prose, though in poetry it is common: as unius or unius, illius or illius: except the i of aliue, which (formed by crasis from aliue) is always long, and the i of alterius, mostly short.

Navibus, infandum amissi, unius ob iram. Virg.

Parite mea paxem totius orbis erit. Claud.

Tu potes alterius studia habere Minerve. Claud.

Modum dum alterius * obligarius bona. Virg.

* Alterius is three times long in Terentianus; de syllab. 1372, de meir. 34; and 464.

4. The penultimate is long in auri, aulae, and other antique genitives of the first declension, and in such vocatives as Pompeii, Cai; because these were originally written with a double i; thus, Pompeii, Cai.

Ethereum femine, atque auri simplicis ignem. Virg.

Accipe Pompei, deductum carmen ab illo. Ovid.

5. In obo, in os (whether interjection or proper name), and in Diana, the first syllable is common.

Ohe! jam fatis ehi, oh, libelle! Mart.

Ruribus, is, magnus clamat toro triumphos. Mart.

Quaere ferebat duceor Sidonius, is.—Conslavum. Sil. Ital.

Io, verba caput, primus jugavit amnis. Propert.

Quis tois causas fugit? quid tos freta longas perpetras? Ovid.

Expert a eam mortem utrique Dianae. Mart.

Juno, Vesta, Ceres, Diana, Minerva, Venus, Mars. Em.

6. Acri, Dios, cheu, have the first long.

Prosinius ehat vire illi levitate, loco.</p>

Ovid.

Inalides: eum ipso deum est diis Camilla. Em.


7. In many Greek words a vowel is long, though immediately followed by another, as Achaea, Achelous, Laertes, Laocoe, and other words compounded with lae; Latius, Enyo, Panchaia, Thetis, Teygetus, Trias, Trius, Galatia, &c.

Erubuit Mavros, aver fires rifto Efesto. Claud.

8. Those adjectives which are written in Greek with the diphthong o, and in Latin with a single o or ae have that o long; as Aeneas, Museum, Darius, Thalia, Clio, Elefagia, Oracides, &c.

Et panacea potens, et Thesala centenaria. Lucan.

9. Most adjectives in eus, formed from Greek proper names, have the e long; and it continues so, when resolved into ei.

Oppida femoto Pelopony marta vigent. Claud.

Notes.—1. Those which contain a choric ("ue") in the two syllables immediately preceding the penultimate, were more frequently formed, for the convenience of furnishing a dactyl, with the penultimate short; as Hecateus, Nelloricus, Agrobus, Antenor, &c. 2. In imitation of the Greeks, we see in Statius, the adjective Tiberius.
6. If the former of two words end in a short vowel, and the next begin with two consonants or a double letter, the vowel often remains short.

Tu poteris viris pennis hebetari sinaragdosa. Ovid.

Note.—Virgil, however, who has adopted such licences as fulcis Hyacinth, and qui amant, has lengthened the short syllable but in one line; "Ferte eit ferrum, date telis, scandite murum." Many of these vowels, which at the end of a word are found long before two consonants beginning a following word, are lengthened by the context; as "Occulta epola, et pluris de pace triumphos." Juven.

Of a Vowel before a Mute and a Liquid.

7. A vowel naturally short, followed by a mute and a liquid, is common, though always pronounced short in prose: as aegris, pharetra.

Natum ante ora pateres, pateraque obruant se atras. Virg.

Note.—1. To produce this kind of position, three things are requisite.

1. That the mute precede the liquid. 2. That the mute and the liquid be both in the following syllable; or otherwise this rule cannot take place; as in ab-luo, where the two consonants cannot be founded in the latter syllable. 3. That the vowel preceding the mute and liquid be short by nature. Hence the a in aecris and matris is always long, because the a in iner and maters is always short.

2. In Latin words, l and r are the only liquids preceded by a vowel and a mute; in Greek words, l, r, and also m, n, have the same effect as Cyclopes, Tec-cneia, Da-phi-ne.

3. H is not, neither in this, nor the foregoing rule, to be deemed a consonant. Joined with any of the consonants, it has the power of lengthening a preceding short vowel; not even with two consonants (i. e. a mute and a liquid) in the next syllable; as His Pellaei proles xofam Philippi.

Cornitet egregius laps hic, cul nomen achates. Prisc.

Hic Paphisius myros, hic purpures amethystos. Ovid.

Arbor habet frondes, paulus femur humanus. Ovid.

Of Graff, or Contraction.

8. Every syllable formed by the contraction of two fyllables into one, is long; as cogeo for cogeo, the genitive afixus for afixus.

Titvre esque pecus, tu poll careeta lates. Virg.

Obscura fortis patres amethystos errant. Ovid.

Note.—This is a rule of very extensive application. We are told that the ancients expressed a long syllable by a reduplication of the vowel; thus vexit for the perfect vix. And it will be found that in many words the long syllable arises from the contraction of two vowels. Thus we write tibi tibi for tibi; ambages for ambages; his, his, for ilphis, trilips; iunior for junior; bosus for bosus; but for but; mi for mihi; and malo for magis volo.

Of Derivatives.

9. Derivatives usually follow the quantity of their primitives; as inimus, inima, anima, animales, animosus, animare; from lego; legemam, legeram, legam, &c.; but from legi; legeram, legeram, legero, &c. talius from totus, and tautos from tot.

Nec sita pari, homo terrae quot totius usus. Lucret.

1. Except defderative verbs in aris, which have the u short, although from the participle in urus, that has u long; as nuptium from nuptia.

2. Frequentative verbs, formed from the second supine of the first conjugation, by changing itus into itae, have the i short; as clamito, volito.

Portariam montes, nescit rudiculis mus. Hor.

Intermix tua teota super coluvero abis. Virg.

3. There are other long derivatives formed from short primitives, and short derivatives formed from long primitives.

Note.—1. Of the former, the following is nearly an accurate list: como from coma; forms and fomentum from favo; humus from homus; iunctus and jumentum from juro; mophia from morphia; regula from regul; regula from regula; regula from regula; regula from regula; regula from regula; regula from regula.

5. Some of these anomalies have, perhaps, arisen from the influence of crafts and syncope. Thus mollis from movae, may have been movibilis; momentum, momentum; motum, movitum; setum, setum; setum, setum; motum, movitum; jumentum, jumentum; from jovae. Sometimes the derivative becomes short by dropping one of the consonants which rendered the word whence it is formed to come, long by position; as differtus from differe; many from many; volutum from volvo; solutum from solven; tulfrum from tulfrum; pox from possum. When the primitive is necessarily short, by one vowel's preceding another, the derivative sometimes becomes long, by the addition of a consonant; as in hiberna, hiberna, hibernae. Liquidus is supposed to have its first common (as it may be derived from the deponent lieque, or from the neuter lieque), on the following authority.

Crafaic cannitium liquidus, et liquidus effrons. Lucrret.

Compound Words.

10. Compound words have the same quantity as the simple words from which they are formed; as perlageo from lego; perlagei from legi; improbus from probus; perjurus from per and jurs-juris.

11. The quantity of the primitive word is generally preserved in the compound, notwithstanding the alteration of a vowel in the latter; thus accido from accio, accido from celery, acquirro from querro, inquisus, oblquus, antiques from aquos.

Multa remissentur, quia jam cedentur, cedentur. Hor.

Except 1. The following are short compounds from long primitives; nihilum from nihil; dejero and pepjero from juro; caudificus, fatidicus, maledicus, veridicus, from dio; semispitus from sopitum; cognitum and agnatum from nontum; hosp from hosp de.

2. Imbecillus from bacillus has the second syllable long: cornu from cumbo has the u common.

Porto meo, nullo dextram subeunte bacculo. Virg.

Imbecillus, iners, fi quid vis addo prejino. Hor.

Cumulatio jugum flabii, propriamque diebo. Virg.

Hec tori Andromache 1 Pyrrhus connubia servas. Virg.

12. Prepositions, in composition, have generally the same quantity as out of it; thus amito and deducro have the first long, because a and de, as a final and monosyllabic e are long. Aboleo and pereimo have the first short, because ab and per, as e and r final, are short.

Expedium, primar repetens ab origine, famam. Virg.

Nec poteris ferrum, nec edas aboletra venus. Ovid.

Note.—1. A preposition ending in a vowel, although out of composition it may be long, becomes short by the first general rule; if followed by another vowel; as deceful, prohibeo. And if a short preposition end in a consonant, and be followed by another consonant it becomes long, by the second general rule; as adimito, percello.

2. Sometimes the preposition, instead of becoming long by position, leaves its final consonant, and remains short; as omino, inoepio.

Except 1. Di is short in dirimo and dijertus: as Hane Deus et melior item natura ducend. Ovid.

Caudas, iniquus, agam Cicero deletius ipdo. Virg.

Marti.
QUANTITY.

16. If the first member of a compound word terminate in \(i\), that vowel is short; as bivium, trivium, tripees, siccidentis, shitrocatra, agricultura, vaticinius, signifiéri, architectura, dimiter, trimitter, ichigenia, &c.

Jane. &c.

1. Except those compounds in which the \(i\) is changed in declination; as quidam, quiquis, quilibet, quattuor, quinque, quindecim, quatuordecim, quintum, quinti, quintus, siquis, or si quia.

2. The final \(i\) is long in those compounds which may be separated without destroying the sense; as ludi, magister, or ludus magister, parvipendio, or parvi penio, lucrificio, or lucrifico, signis, or si quis.

3. Those words which in joining undergo a change of sense, are long; as tibicen for tibicen, bigis, triges, &c. for bigiges, triges, &c.; ilicet for ile licet; felicit for feli licet; but tibicen, which has suffered neither, is short by the general rule.

Ite! ignis edax summa ad fæligna vertex.

4. Idem mafeline is long; but in the neuter it is short. Idemidem has the penultimate short.

Omnibus animo animus, ledetera excedere territ.

Instim qui scribat, idem factum occidit.

Qui fedens adversus idemdem te.

5. The final \(i\) of the former compound word, is long in nimimum, ubique, ubritique, ibidem.

Dixi equidem et dico. Captes altatus ubique.

6. As the \(i\) is common in ubi; so it is in ubique and ubivis.

Clausus: io matres audi nobis quesque. Latine.

Servor, ubique eis: uti mea grada ferio; Ovid.

The compounds of dies have the final \(i\) of the first word long; as biduum, triduum, meridies, pridie, posttridie.

Si solis tibi triduo legatur.

Note.—1. Pridie and postpridie are long by exception 3, being prior dies, and posterior dies.

2. Quotietae and quotidians are said to have the \(i\) sometimes short; but this is not satisfactorily ascertained, since the lines added in proof may, by the figure synizesis, be differently measured: thus

Conjunctus in culpa fragrantio quotidiana.

Catal.

Or quotidiana. It must be confessed, however, that thus read the line is harsh, and is unnecessarily rendered spondaic.

3. Triginta, trigintis, trigintis, triginti, are not considered as compound words, in which the \(i\) is short, as it is in all the real compounds of trid, etc. trigintes, sestina, stigmata, triginta, etc. &c. for triginta cannot with propriety be called a compound word, since sintas is only a termination. At all events the \(i\) of triginta, etc. is ever long.

17. If the first member of a compound word terminate in \(a\), it is short; as Argonna, aromphylax, arseopag, bibliotheca, philosophos, faceretanclus, duodecim, hodie.

Non natus putito, sed Argomnauta.

Mart.

Non dies hodie, quantum hic tam patris tandem — Hor.

1. Except words compounded with intro, retro, contra, and quando; as introducus, introdutio, retriciduo, controvercus, quandique, &c.; but quandocidem has the \(o\) short.

Isto retrovertitur equilines prataea ora.

Ovid.

2. Allo aliquus, utroque, exercet quius, utroque; and
and the compounds of quo; as quomodo, quocunque, quominus, quocirca, quovis, and quoque the adjective; but quoque, the particle, has the ο short.

Mendax est natura, ali·gui·que velatur. Hor.

3. Those words which in Greek are written with an ο-megas, have the ο long; as γεωμετρία, γεωγραφία, mìnōtaurus, lágopus.

Si nascentem gaudent lámpade Flaccus. Mart.

18. U and Y terminating the first member of a compound word, are short; as in Thrasýbulus, Eurýpylus, Polýpus, dúcēnti, dúpondium, quadrapés, centíplex, Trogýgena, cornúpeta, Polýdorus, Polýphemus, &c.

Nam qui dixit quæque cavō Polyphemum in antro. Virg.

Except jūdicē, which in its first syllable is, by syncope, long.

Et supras, et metum loci et Jove jādocat, quæ. Hor.

Of the first Syllable of Dīssyllabic Preterites.

19. Preterites of two syllables have the first long; as vēnī, vidi, vīcī.

Verī sunt duas dies, et ineluctable tempus. Virg.

Except bibi, tūli, dēdī, rēti, fīcti from scindo, (for abiciōd is long from abicendo, and abicēri short from abiscendo,) fidi from fīndo, (for fidi and confidi from fido are long.)

Aut fēcīt, et medias fecit ibi littora terras. Lucan.

Of the two first Syllables of Reduplicated Preterites.

20. Preterites doubling their first syllable, have that syllable and the following both short; as tētī, pēplū, pēpēri, dīdicī, tūticī, cēdīcī from cado.

Si mūnat fuerat tibi quattuor, ēllα, dēcēta. Mart.


Except cēdīcī from cado has the second syllable long; and likewise those preterites, in which that syllable is followed by two consonants; as fēfēlli, mōmōdī, ἕφσονδο.

Ebrīus et petulas, qui nullo forte cecidīt. Juven.

...... vatum fēpōndiā: nulla proper sero fiero. Senec.

Quæ Deum ipse virīa sinterna foribus fēpōndiā: Prud.

Note.—From the authorities here quoted, it is evident that fēpōndiā is the clasical orthography, not fēpōndiā, which would have the first syllable long by position, before syllables, as we may invariably observe in compound words; as rēfūn, rēplūcio, rēpons, rēfērō, rēspergo, &c.

Of the first Syllable of Dissyllabic Supines.

21. Supines of two syllables, and the perfect participle formed from them, have the first syllable long; as vītum, mōtum, ēłfum, rētum, vītus, mōtus, &c.

Terribiles si fīman formae, letumque, laborque. Virg.

Quos ego — fidēs mōs praetax componere fūcitus. Quīnt.

1. Except the first syllable is short in daētum, rātum, fātum, ēltum, lītum, quītum, sītum, rātum, and fūtum, from the obōfle fuō, whence we have futūrus.

Cui daētus hærebam caēlōs, curiaeque regēbam. Virg.

2. Cītum from cīeo of the second conjugation has the i short; but cītum from cīeo of the fourth conjugation has it long.

Corripit lēve, et teēcis cītus extulit aliis. Virg.

Unde rumpere concitā periculum mundo. Lucan.

3. Statum is common: hence we find fāturus, conflāturus, oblāturus, flāmen, rātus-s-um, rātus-ūs, Vol. XXIX.

praefītūm, fātio, fātuo, flābilis, flābulum, rātor, fātum, &c.: the former of which are said to come from òo, the latter from fōtō.

Hec fōtus in caldo multos permanit in annis. Ovid.

Damnāvit multō fātūrum fangeā Martem. Mart.

Suffītto imperi, cuius famōsitās honorum. Claud.

Non profectō sībi praefat naturā sed unus. Prop.

Confītūra fuit Megalēnē purpurea centum. Mart.

Of the first Syllable of Polyssyllabic Preterites and Supines.

22. Preterites and supines of more than two syllables have the same quantity in their first syllable as the present; thus vōcāvi and vocātum have the short, because the first of vōco is short: clāmāvi and clāmātum have the first long, because the first of clāmo is long.

Si vōcat officium turba cedente vestītur. Juven.

Indiūt, impluviaque mero, divoqve vōcāvit. Virg.

Except pōsui, pōsitum from pōno; gēnui, gēnītum from gigno; pōtui, pōsitum from politum, vōltum from volvo and volvō.


Of the Penultimate of Polyssyllabic Supines.

23. Supines of more than two syllables, in ētum, ētum, and ētum, lengthen the last syllable but one; as amātum, dēlētum, minūtum.

24. Supines in ētum, from preterites in ēvi, also have the penultimate long; as cupīvi, cupītum; petīvi, petītum; quēsvi, quēsvitum; polīvi, polītum; but the compounds of co, ambio excepted, have the penultimate short.

25. Supines in ētum, from any other preterites, shorten the penultimate; as cubīvi, cubītum; mōnīvi, mōnītum; abōvīi, abōvitum; agnīvi, agnītum; cōdīvi, cōdītum; recēsvitum of recōfleo is long, on account of its origin from the obfole cenīo, cenīvī.

Namque servavit luēν Cēsenam Phaethontis amāti. Virg.

Delēs Silvōrum acies, eccēsīs Canīlum. Virg.

Sātituēt erūtus vincīs ad sēdēs palmas. Virg.

Σαρκό εὐκατσίται prōbhs, gladiāque petītus. Claud.

Codōnem Phēnto, et nomēs multās equām. Virg.

Pētēs recēsvitēs evolviā equēs fallātūs. Claud.

Of the Penultimate of Participles in Rūs.

26. Participles in rūs always lengthen the last syllable but one; as amātūrus, habītūrus, lecītārus, auditūrus.

Tādēs verit, feris faētāra nepōtibus umbrae. Virg.

Increment of Nouns.

Note.—1. If the genitive case singular do not contains a greater number of syllables than the nominative, that noun has no increment, as pēnia, pēmav, carō, cārīs. But if the genitive contains more syllables than the nominative, the penultimate of the genitive is the increment; and whether that syllable be long or short, it preserves the same quantity in all the oblique cases singular and plural. If hēbus or hēbus be an exception, we should recollect, it is so by syncope and craits from hēbus. Aufonius, contrary to the practice of better authors, has an example of hēbus short, as if it had been formed by simple syncope without craits. See Aufon Epig. 62.

2. Nouns seldom have more than one increate in the singular, except, (when its genitive is jecimovair,) supellēx, and the compounds of captāt, ending in μα, have two increments. The dative and ablative of the third declension have two; of the aforementioned words, three increments. They are reckoned in the retrograde order, beginning with the penultimate, for the last syllable is never considered as an increment.

1. i-tn-e-ris, i-tn-e-r-bus.

2. jec-tn-o-nis, jec-tn-o-n-bus.


4. an-cal-tis, an-cal-t-li-bus.

5. B b
Of the Increments of the Singular Number.

Of the first, second, fourth, and fifth declensions.

27. In the first, fourth, and fifth declensions, there is no increment in the singular; except the antique increment of the first declension, by the resolution of the diphthongs in ai, in which the ai is long: as

Dives equum, dives pipelli vehis et aurum.

Verg.

28. The increments of the second declensions are short: as

pueri, viri, faciuli, teneri.

Verg. 

O pueri! ne tanas animis affligo bella.

Verg.

Except Iberi, Libræ, and its compounds Celtiber, Celtibéri, which lengthen the penultimate; as

Quaque fers movit, Ser-orius exit Iberos.

Lucan.

Vir Celtibéri nescit genitibus.

Mart.

. Increments of the third Declension.

29. Nouns in A shorten the genitive penultimate; as dogma-atis.

Non quiius videt immolatun poenætia judæus.

Hor.

30. Nouns in I, compounds of meli, shorten the genitive penultimate; as hydromel, hydromelitis.

31. Nouns in O, increasing in ïnis, shorten the genitive penultimate; as cardo, cardinis; imago, imaginis.

32. Enis and onis, from or, are long; as anio, anicius; fermo, fermö尼斯.

1. Except gentiles in generally shorten the increment; as Macedo, Macedonius; Saxo, Saxonianus. To add which Lingones, Scuones, Teutones, Vangiones, Vafiones. Some lengthen the penultimate; as Su- effiones, Vettiones, Burgundiones, Eburones. Juvenal shortens Britones; Martial lengthens it.

2. Nouns in er, from the Greek, or which sometimes drop the n, preserve in Latin the same quantity which they have in the original; as Agamemnon or Agamemno, Agamemnonis; Demipho or Demiphois.

Sanguine placátia ventos, et vingéna cafa.

Verg.

Hæc tum multiplex populus fœminæ replebat.

Verg.

Non longissimum deort domus quod Sævius Tethys. Claud.

Qua non tarthrels Cambri, nec Britonum unquam— Juven.

Quam veterebrae Britónum pauperis et quam— Mart.

Quo fero inquit poet Amagemono fero— Ovid.

33. Nouns in EC lengthen the genitive penultimate; as haelectis.

Hæc est sed quam protinus ipsa vore.

Mart.

34. Nouns in D shorten the genitive penultimate; as David, Davidis.

Ereco inductis Davidis origine lumen— Juven.

Note.—Ecclesiastical writers often lengthen the penultimate of David.

35. Masculines in AL shorten the genitive penultimate; as Hannibal-älis; fal-älis (masculine or neuter).

36. Neuters in AL lengthen älis; as animal-älis.

Verae sunt pereat, et luminis solis vere ventur.

Verg. 

Prenques cum spectant annuláta extre. terram. Ovid.

37. SOL lengthens solis: and also Hebrew nouns in EL lengthen the genitive penultimate; as Daniel-ëlis.

Regis solis est fulminis solis columnas.

Ovid.

38. All other nouns in L shorten the genitive increment; as vigil-ëlis, conflu-ëlis, exul-ëlis.

Aut urbem, aut pulchritud, ha main plebeocula pudet. Hor.

39. Nouns in EN shorten the genitive penultimate; as crimen-ënis, flumen-ënis.

Quoqua magis mirum est, audetem crinemis hujus— Mart.

40. No certain rule can be given for the quantity of the increment of nouns ending in UN. Many lengthen the genitive penultimate; as Chiron, Demiphon, Agon, Helicon, Lacon, Secyon, Solon, Simon; many shorten it; as Acteón, Agamemnon, Amazon, Iasion, Memnon, Philemon, Orion, Sidon, Sindon; and Ægeon has the penultimate common.

Credit, et excludit fanos Hecatæno poetas.

Hort.

Et vehit abuentem certamin Ammonis clamant.

Ovid.

Audaciter datas lavamns Ægina noua

Stat. 

Ægina inuia immanis erta lacertos.

Ovid.

41. All other nouns in N lengthen the genitive penultimate; thus Titan-ënis, Siren-ënis, delphin-ënis, Phorcyn-ënis.

Concitat iratus validos Titonos in arma.

Orphus in hybris, inter delphíno Asio.

Verg.

42. Neuter nouns in AR lengthen the genitive in ëris; as calcar-ëris.

Seu fumansæque equi ferceribus armos.

Verg.

But these neuters shorten ëris; bacchar, jubar, neactor-ëris. To which add par-ëris, and its compounds; as impar-ëris; dilpar-dilpars, &c.; also hepar-ëris.

Pugnavere pérœs; succubueru pérœs.

Mart.

43. But masculine nouns in AR shorten ëris; as Cæfar-ëris, Hamilton-ëris, lar-ëris.

Eccle Decius princeps Cæsaris alium.

Verg.

Except Car and Nar; as,

Laudibus immodicis Cæsars in alia ferunt.

Mart.

Sulphures posuit sparsim Néris ad undas.

Enn.

44. Greek nouns in TER lengthen the increment; as crater-ëris, character-ëris, spinhëris; except othér-ëris.

Indulgat vino, et vertunt craterës abhena.

Verg.

Quæcumque illa levan fugiunt facet æthera pennis.

45. Nouns in OR lengthen ëris; as amor-ëris; timor-ëris.

1. Except neuter nouns; as marmor, àquor-ëris.

2. Greek nouns in OR; as Héctor, rhetor-ëris.

3. Arbor-ëris, and membr-ëris.


46. The following nouns lengthen the increment; fur-furis, ver-veris, Recimer-Recimëris, Byzer-Byzëris, Ser-Sériis, Iber-Iberis, (as well as Iber of the second declension.)

Velenque ut solis delectant temnë Sôris.

Verg.

47. Other nouns in R, not mentioned; shorten the genitive penultimate; as aer, æris; mulier, ëris; cadaver-ëris; iter, itinis; verber, verberis; vultur, ëris; marmur, ëris; fermur, robor, jecurt, ebur-ëris; martyr-ëris.

Si nigro obstruto comprehenderit íera cornu.

Aphicæ, venetiæ occidentum marmístri auræ.

Verg.

48. Latin nouns in AS lengthen the increment; as pictas-ätis; Maccenas-ätis; vas, vatis, a vesel.

Insignem pictâtis virum tot adire Liberes.

Verg.

Except
49. Greek nouns in AS shorten ἄδις, ἄτις, and ἀνίς; as
Pallas, lampas, ἄδις; artocreas, ἄτις; Melas, ἀνίς.

50. Nouns in ES shorten the increment; as miles, milītis;
feges, fegetis; preces, praesidis; obses, obsidis; Ceres,
Cerēris; pes, pēdis.

51. Nouns in IS shorten the increment; as lapis, Phyllis,
īdis; cinis, ēris; sanguis, īnis.

52. Nouns in OS lengthen the increment; as nepos,
ōtis; flos, florīs; os, ōrīs; custos, cultōdis; rhinoceros, ōtis;
Tros, ōis; ēris, ēris.

53. Nouns in US shorten the increment; as lepus, corpus,
ōrīs; vellus, ēris; tripus, ōDIS.

54. Nouns in YS shorten the increment yīdis and yīdos,
and lengthens yīnis; as chlamys, yīdīs or yīdos; Trachys,
ynis.

55. Nouns in S, preceded by a consonant, shorten their
increment; as celebīs, ìtis; ìtīps, ìtīps; Lælaps, ìpis;
Cecrops, Dolops, òpis; auscepīs, ēpiis; hiemis, ēmis; also
ancepīs, biceps, cipitīs, and similar compounds of caput, in
which both increments are short.

56. Nouns in T shorten the penultimate of ītīs; as
caput, ītīs; fisciput, fiscipitīs; occiput, occipitīs.

57. A noun in X shortens the vowel before gīs; as
darbax, āgis; grex, grēgis; aquilex, lēgis; biturīx, īgis;
Styx, ygis; Allobroxx, ògis; conjux, ùgis; Phryx, ygis.

58. A noun in EX shortens īcis; as vertex, īcis;
ponifie, īcis; vīx (rather vībic), īcis excepted.

59. But EX having īcis, lengthens the increment; as
vervex, īcis.

60. And all other nouns in X generally lengthen the
increment; thus nouns in as; as pax, pācis; forna, ācis.

61. Thus words in IX; as radīx, felix, cicatrix, nutritx,
vīctrix, altrix, perdis, coturnix, pernīx, lodix, īcis.

1. Except appendix, chōnix, coxendix, cilix, calix,
forcīx, filix, hilīx, larīx, pīx, falīx; vārīx, īcis, and
ītrīx, ētrīgs.

2. Nix, nīvis; mačtīx, īchis, a gum.
62. And words in OX; as vox, vocis; velox, ócis. Except Cappadox; precóx, ócis.

Conditum et magna supremae nóce ciumus. Virg.
Mancipii locules, ergo φικρά Cappadociam réx. Hor.

63. In UX; as lux, lúcis; Pollux, lúcis. Except dux, crux, nux, trux-lúcis.

Refilis Ἀνέσσ, claraque in Uce refullit. Virg.
Confedere díces, et volgi flante corona. Ovid.

64. In YX; as bombyx, ycxis. Except onyx, ſyclis; Éryx, ycis; calyx, ycis; Narły, ycis. But Sandyx and Bebyx have the increment common.

Nec sēqua Arabio lucet bombycethe puella. Propert.
Illeque plecto, yel it fælicis amītis. Propert.
Interdum Libycon focantur fandīre piúm. Gratius.

Of the Increments of the Plural Number.

65. The plural increments, A, E, O, are long; as musárum, ambábias, animábias; rérum, rébus, hórum, quórūm, regnórūm.

Tuque, húrum interpres euráum, et concía, Juno. Virg.
Solicit in nobis rórum natura novata est. Ovid.
Róbus in angulis facile et commone veròm. Mart.

66. The plural increments I and U are short; as quibus, tribus, montibus, vertibus, lacibus.

Except bibus or bōbus, which, on account of its contraction from bōvibus, as already explained, is long.

Neêh tróbus nodis ternós, Amaryllis, colores. Virg.
Non ópulós mentes hóminem curaque levantur. Tibull.
Pars in frábibus teant, verolim菲ne temporīta fígunt. Virg.
Cum faver eduxit, lacitus demittit: at illud — Ovid.
Et totum huius cursus arcávis orbum. Virg.

 Increment of Verbs.

Note—1. When any part of a verb exceeds, in the number of syllables, the second periphras, the increafer regulus the indicative present, active, the excess is considered as the increment. As in nouns, the last syllable is never reckoned the increment; it is also in verbs; and, therefore, when there is only one increafer, it must be the pre- increment.

2. Thus amat, amant, ama, amem, amans, containing, like amas, only two syllables, have no increment. A-ma-mus, a-má-mis, dō-tis, dō-tes, dō-mus, have one increafer, because they exceed, by one syllable, amas, ãs, is, is, is, and das. A-ma-ba-mus, a-ma-bi-mus, have two increasements, because they exceed amas by two syllables. A-ma-vir-tis has three increasements. Au-
di-ese-ba-mi-ni has four, because it has four syllables more than audis. In determining the increasements of deponent verbs, an active voice may be supposed; thus, co-nas-tur has one increafer: co-nas-tur, two; co-nas-em-ni, three; because cons of the fictitious active voice has but two syllables. Or their increasements may also be regulated by other verbs of the same conjugation and number of syllables, which have an active voice.

67. A is long in the increments of verbs; as fláman, fláres, prope-rámus, doce-bárum, audíe-bámini.

Serius aut cílius sedem prope-rámus ad unam. Ovid.
Pannabam armis, qua aet fátricèrus alius. Hor.
Et canóre pares, et repindere portési. Virg.
Conséptilem ibam, cum e muo plurima flui. Virg.

Except that do, and its compounds of the first conjugation, have a short in their first increafer; as dámus, dábitur, däre; fo circundábamus, venundábo, &c. But in any other increment do, like its compounds of the third conjugation, is long; as débámus, dedicáti, circumdábamus, crebdiámus. Hor.

68. E is long in the increments of verbs; as débam, rébar, amérís, docérem, legérunt, amémus, amérarús, amáfíctis, régebat, audíebar, &c.

Sic aequidem duébam animo, rébarque futurum. Virg.
Ne juvenes célebret multo larinas, vrsó. Tibull.

Except 1. E before R is short in the first increafer of all the present and imperfect tenses of the third conjugation: as legérès or legere, the indicative present active, and imperative conjugation; legèrem and legèrér, the imperfect subjunctive active and passive. But réris and rére are long; as amarérís, amárécè; docérem, docére; re-

géreré, regéréré, audíreme, audíère.

Parère perfons, dicère de vitis. Mart.
Sic fensus Pelus, fi moréeretur, crat. Ovid.
Cum confirmatis dirécte rerum equi. Ovid.
Naltra, neque ad ides victor echeéré. Virg.

3. Béris and bérè are every where short; as ama-
béris, amabérís, monóbérís, monobebe; and among the ancient, largibérís, experibérís of the fourth. Ex-
cepting where the & belongs to the termination of the present; as scribérís and scribère of the future passive being long by the general rule.

Sanguine Trojano et Rutulo datáre, virgo. Virg.
Scribérís Varo f eros, et hostiam— Hor.

4. By syllóle, the poets sometimes shorten e before runt; as

Obánupe ferox runt per comás, et vox falcibus hæc. Virg.
Di ti bi divíxas ducérunt, arumeque frondes. Hor.

69. In every increafer, (whether the first, second, third, or fourth,) I is short; as amábimus, docebimini, regitérum, regísum, audíminum, audíebamini.

Mora tarda mente cedit: simul ite; sœcumímini. Catull.
Venímus; et lates indíce cumuis agros. Ovid.

Note.—In such verbs of the fourth conjugation as have in the first periphras plural of their present and perfect indicative, the same words, in regard to spelling, there is a distinction in the penultimate of the former being long, as venímus, repérimus; and that of the latter short, as venímus, repérimus.

Except 1. These have i long; simus, velimis, no-
limus, with the other perfons coming from them and their compounds; as sitis, velitis, nólis, nólice, nóli-
tote; malímus, malitis, polísimus, polísitum, &c.

Ne nimium simus, flítorum more, molesti. Mart.

2. I before ei in preterites is always long; as peti,

quisísti, audiisti, and in its derivative perfons; as peti-
virá, quasiísti, audívimus, &c.

Ceffi et sublato montem genitore petiél. Virg.

3. The first increafer of the fourth conjugation is long; as audímus, audíris, audíter, audiéto, audiéris, scimus, scire; and in auditum, as it is sometimes con-

tracted;
traced; and in ibam and ibo, from eo. But when a vowel follows, it is short by position, as audiebam.

Norinit teneris immutat ubera labris.

Lenibant tunc vulneris nostra finit.

Tu ne cede multa; sed contra audientior iae. [Virg.]

Jungimus hospitio dextris, et te felicem.

Qui non editas, futuri sibi falsabit.

Note.—Imus in every preterite, and in that of the fourth conjunction also, is short; as jumivis, vidimus, fectum, venimus, amavimus, adeoimus, percepimus, meminimus.

4. Rimus and ritis in the subjunctive preterite are short.

Egerimus noni; et nimium meminisse necesse est. [Virg.]

5. Rimus and ritis in the perfect future subjunctive are common.

Ous ob res, ubi viderimus nil paene creati.

Nec mi aurum pofo, nec mi prestum derelit us. [Lucet.]

Videritis illas ille, ubi circularus axem.

Deum cum millia multa facerimus. [Enn.]

Oderimus magis in culpis puno creatis. [Lucet.]

Cum mavis Jovis transcivit aquas. [Ovid.]

Note.—We have innumerable examples to prove that rimus and ritis in the perfect future subjunctive is common; but concerning the quantity of rimus and ritis in the preterite subjunctive, grammarians are not agreed. A difficulty in this investigation arises from the similarity of the two tenses; the latter having not uniformly been taken for the former, and vice versa; for "the perfect of the potential seems to be both past-perfect contingent, and future-perfect contingent. The perfect future has also to go a great affinity to the preterperfect potential, that on a word may, confidently with the feme, be supposed to belong to either. As these tenses are usually interpreted in English, there is a great resemblance in their structure, as well as in the ideas which they express. Both are composed of verbs in present time, the one a verb of present liberty, or the like, the other of present intention or obligation: of an infinitive denoting future or definite to be; and a participle signifying the perfect of the action denoted by the verb: thus, I may have written, I shall have written."

We find by A. Gallus, 18, 2, that it was a subject of dispute at Rome, whether the tenses in rim ought to be considered as past or future, or both. Such disputes may, perhaps, have arisen from the accidental circumstances which are involved, besides the immediate action of the verb; in the same manner as, in English, two forms, precisely the same in their structure and reference, are characterized by certain grammarians under different times, viz. I may write, and I shall write, the former being named, from the accented idea, a present, and the latter, from the deaccenting action, a future, while, in reality, if we apply the same criterion to them, they are both present, or both future. Indeed it has been contended that the future had the termination rim, as well as ro; so that it is reckoned not improbable that both may originally have been but one tense, which had both a past and future reference. It is evident that this is a confusion by no means irrelevant, but indispensably necessary, before we can, with certainty, determine the quantity of rimus and ritis in the subjunctive preterite. In addition to the authorities for reckoning rimus and ritis common, there is likewise sufficient example from Horace, Martial, Ovid, Seneca, Tibullus, and Plinius, to consider rits of the future, at least as common; and this is an argument founded on the analogy of other tenses between the quantity of the final syllable of the second person singular, and the penultimate of the first and second persons plural, for considering the following rimus and ritis also common.—Rimus, ritis, and ritis, are usually accounted short; but it is exceedingly probable that, whether referred to the preterite or perfect future, they fill might be used as common.

70. O, in the increment of verbs, is always long; as amatō, facitate, tōtē.

Cumque loci poterit, mater facitātī filiūtis. [Ovid.]

71. U, in the increment of verbs, is short; as sūmō, pofitūmus, volūmus.

Dicēte, Perides: non omissis p̄ıtum̄s omnes. [Virg.]

Note.—For U in the penultimate of the future in run, see the rule.

Section 11.—On the quantity of the penultimate and antepenultimate syllables, and on the quantity of such as are usually said to be long or short by authority.

Note.—It is very well known that the profodial rules, hitherto est, determine not the quantity of every syllable of the Latin language; but of such only as are more commonly ascertained from the circumstances of position, division, preteritis, subjunctivus, imperativus, and final. Therefore, if a number of inflections, the inquiries of the student are at a stand until he can appeal to that observation, which would be more happily employed in confirming his previous acquisitions. And thus with but partial instead of complete information, he arrives at the mere intimation, the first lines of his progress, at the time being when unquestionably might achieve the second, the satisfactory and practical illustration of his previous attainments. If we depend on practice for the first principles of our knowledge, we lose its best and happiest effect. Practice will always instance its most prevalent efficacy, when its office is alone to rear the superstructure on the basis of regular system and theory, and not to attempt the casual and fortuitous talk of laying a rudimentary foundation, and that too on a vacuum, the baseless texture of ignorance, not admitting that analogy and arrangement, that reciprocal and corroborative illustration, which so essentially aid the intellectual faculty with its decided and permanent improvement. The part which follows is an attempt to supply this deficiency. It was obtained by four consecutive analyses of the language, in which every word and syllable fell under minute and decisive consideration. This investigation was undertaken in consequence of its being suspected, since it is a general rule in the profody of the Latin language, that a vowel is either before two consonants, &c. is long, that a law exists, directly the reference of this, and of not let extensive influence; viz. that a vowel before a single consonant is short; though each of these general and very extensive rules, may have, in special cases, their exceptions.

The refuit justified the expectation peculiar to that, and principally with the addition of another general rule, the profodial system might become so comprehensive, as to include and provide for the whole language; and consequently, for all those syllables usually said to be long or short only by authority. The exceptions to this general principle are chiefly included in the rules for the penultimate and antepenultimate syllables. And though some of them have appeared in former treatises, yet from their enlargement, the addition of others, the general rule, and its more special exceptions, which have arisen from the repeated analysis we have undertaken, it will be easy to perceive, that we have in this part some claim to originality. In the preceding rules, and in such as shall follow on final syllables, in justice to the subject and our readers, we have felt it indispensably incumbent on us to avail ourselves of the valuable researches of preceding and contemporary profoundists. And the originality of this section places us under the obligation of devoting particular attention to the monosyllabic monosyllable, that is to say, of showing the comparative, that every rule and exception, which we now first offer, might not appear to rest on our bare assertion, but on the only legitimate warrant, poetic fiction. And thus, perhaps, we have now the opportunity, for the first time, of offering the only complete collection or system which determines the quantity of every syllable, at least of pure and Augustan Latin, that has hitherto been presented to the public.

1. Masculine patronymics in ades or ilder usually shorten the penultimate; as Priamides, Atlantiades.

Argu hic praeium temum coro tepo tecre. [Virg. Enn. 6. 494.]

1. Except those formed from nouns in ies as Pelides.


2. Amphiaraiides Naupactoo Acheo. [Ovid. Fab. 2. 43.]

3. Beldes nemen Ptmides et inclyta fem. [Ovid. Atn. 2. 82.]


5. Quique Lycurgides laevus, et areo naumae. [Ovid. ivn. 1. 505.]

2. Patronymics and similar words in ais, ies, and iiis, lengthen the penultimate; as Achais, Poletamis, Chrysies, Anthes, Minos, and Latois.

Pietas, epides, rapa Minoides, Dian. [Ovid. Met. 8. 174.]

Except 'Thebias and 'Phoecis: Niger is common.

1. The-
QUANTITY.

1. Thetætis jussis sua tempora frondibus ornatis. Ovid. Met. 6. 163.


5. Words ending in acus, icus, and idus, shorten the pen- nalitate; as 'Ægyptice, 'aromaticus, 'callidus.

1. Quos 'Ægypticos temper renullis ab eo— Call.

2. Idaeus locos, ubi mollis 'americus illum— Virg. Æn. 1. 693.


4. Urque fuam laiques, quos 'callidus addidit succep. Ovid.


5. Allo 'nīdus, 'sidus; 'fidus, infinis: but 'perfidis (from fer and fides) follows the general rule.

1. Ah! pereat quincunque meridius repertis uas. Prop. 2. 3. 7.

2. Continuus montes, nif doliocrurum opæa. Hor. Epist. 1. 16.

3. Efe tibi magnus, Thelêfene, videris amicus— Mart. 3. 40. 3.


8. Pretul poterit tam frugi tamque pudicus. Hor. b. 2. 5. 77.


4. Words ending in 'imus or 'ynus, shorten the pen- nalitate; as finitimus, maximus, thymus, fortissimus.

Thus animus, decimus, fluxus, oculus, anonymus, callionymus, and all adjectives and superlatives in imus shorten the penultimate.

1. Emelle heroum quandam fortissime fructa. Virg. Æn. 5. 389.


2. And two superlatives, imus and primus.


3. Scribere si fies est ir mentions turpis mimos— Ovid. Trist. 2. 515.

4. Aut fpidos ego jam rais apudob lodios. Hor. Æn. 10. 449.

5. Deplote quadrinum Sabini. Hor. b. 1. ed. 9. 7.

6. Quaerer attonata fructibus et virgultas capelle. Mart. 7. 73.

7. Que, velut latis qua fit primus campis— Hor. b. 3. od. 11. v. 9.

Note.—The quantity of the penultimate of patrimus and patrimus is undetermined: Facciolatus, the Italian lexicographer, says "lis est inter grammaticos de quantitate eorum penultima, quae abhinc est ub juicit, quia ehi certi forser adhuc paulatim." 1. Truditur s fico radis oolaggis ligne. Virg.


4. Ex descrip tum terris de eras sinis redit. Virg.


7. Adjectives in imus derived from nouns signifying 'trees, 'plants, and 'stones; also from 'adverbs of time, or from sublatives signifying the four seasons of the year, shorten the penultimate; as fugius, hyacinthinus, adamanthinus, eratlinus, diutinus, perennius, chimerinus, annutinus, hor- notinus; to which add bombycinus, elephantinus, which seem rather to refer to the fish and ivory, than to the animals themselves.


1. Suadets Assino fugere, ne potice carp. Phadr.


3. Tum caput ipsi sufer domino, truncumque relicquit. Virg.


6. Quicquiam mundi terminus obtulit. Hor.

2. 9. Other vowels before final 'is, 'ius, or 'us, is long; as mo- nile, annalis, mules.

So ancle, bovile, bülæ, caprile, cr. ile, fœcile, fœ- nile, ile, incile, mantile, mantile, ovile.

And âles, anilis, aprillis, civilis, carduellis, curulis, crudulis, confugalis, doxitis, exitis, fidelles, herilis, milles, patruelis, proles, quinitiis, subtulis, fetulis, etc. &c. with many others.

1. Et opportunum te botuli condit. Phadr.

2. At qui umbrae gerunt capilis tempora quercus. Virg.


6. A vowel before final 'es, 'els, or 'les, is long; as mo- nile, annalis, mules.

So ahénus, ãnum, prunus, prûnus, sèrènus, vêné- num,
;

.

—

.

QUANTITY.
Bum, vanus, and many others ; for the nouns and adjeAives comprifed by this rule are numerous.
Aut numtana

armU.

fedet circum caftella fub

duceni, and other numerals in
inclinis,

Fufcos colores, Galbanos habet mores.
S. Et maiius in gremio languida fatta jacet.
3. Quid tantiim occuno properent fe tingere

Non

kntaque

fine iiatanti ;)/at«7io,

4.

venis

Virs.
Catul.

inrore.

at

^^i^m

contri

fie iilius

I

At

IZ.

Omnibus

Smus

12- Ta;dia dulcisOnis aufcrat

Words ending

10.

jieiics eft unum vafti cuftodia mundi.
Sic cantbus catulos fimiles, fie matribus hados.

pondus.

Ovid.

Me

Ovid
Virg.

A

Juven.
Virg.

vowel before final 'nea, ^neo, '^nia, 'nio, "'n'lus. Sod
long ; as iTnea, caiieo, miinia, punio, favonius,

is

fcrlnium.

So aranea, ganeo, declTneo, delTneo, Ilneo, cicSnia,
msania, Ironia, colonia, alcedonia, lacTnia, querim5nia,
delenio, exinanio, finio, insanio, miinio, confinium,

sIho, inquino, coinquTno, circino, femino, gran-

patrimonium, vadimoniura, and many others.
smite, et placitum liti componite fcedus.

Except

Virg.

'clTno,

'divTno, 'omnTno, "'propTno, 'fuplno; alfo

and

its

'compounds,

as acclino, inclino, pro-

In foribus lasos fufpendit an'mea cafles.

Hac
Non

divinavi, notitiamque

me, hxc nunc oinnino ut crederem.

3.

4.

Stat.

^€n\o propinabit, Calliodore, tibi.
Gramen, et erefto curnim temone Jupinant.
J. Quare etiam, atque etiam paulum c^inare necefle.
6. /nc/inaf cuifus

3.

;

et

:

Except

1.

vadimonta

'caftanea,

Juven.

prsetori

^maneo,

'tinea,

'moneo, '^teneo.
2. Alfo "ignominia, 'venia,

Lucret.
Ovid.

eafdem ciVcinaf auras.

Virg.

Carpamus dum mane novum, dum gramina cSnent. Virg.
Sicvit amor ferri, et fcelerata iHsaiu'a belli.
Virg.
Oppida cceperunt munire, et ponere leges.
Hor.
Primo reftituent vere Favonii.
Hor.

56. Pullati proceres, diiFert

Ovid.

tuli,

Terence.
Mart.

impulit

2.

4-

clTno, recllno.

2.

duris,

For

nium,

1

1.

Hot.

3.

dino, germino, eminor, procraftino, comperendino
the compounds of cano, as concino, and many others.

Nunc

patemum
s«e pondere habentia

MoUia cum

14.

or inor (horten the penultimate;

as lino, fulmino, termino.

So

'mineo,

'linio, '°lanio,

CaJianeiE moUes, et prefii copia la6lis.
a. Aut tineas pafces taciturnus inertes.
I.

Other vowels before

1 1

final

no or nor are long

;

as

niano, exareno, pono, Juno.

So piano,

3.

and feveral

trano, fereno, dono, conor,

others.

Mic

te

fragili

danabimus ante

Virg.

ciciitA.

7.

8.

''reno,

^

honor, 'sono, and Uono.

Mufas, paullo majora ctinamus.
Sed juremus in h«c ; fimul imis iaxa renoTint,
4. Te lyra pulfa manu, te carmina noftra sonabunt.
5".
Cum tonat, exanimes primo quoque murmure cceli—
1. Sicelides

Virg,

1.

Hor.

12.

A vowel before

final

na

is

long

Juven.
Ovid,
Juven.

Except 'advena,

''buccina, 'domina, ''gena,

'machftia,

'foemina,
"trutina.

Virg.

popofcit.

^pagina,

'farcina,

Non tamen

8.

Quam

4.
5.
6.

—

fibi

qua^ Vari prselcripfit

pag'ma nomen.

10. Ebria nos madidis rumpit tibichia buccis.

11.

13.

mSne,

Si volet,

fifcina,

manes,

Mart.
Juven.
Virg.
Juven.
Cr,l.

Virg.

'ro, '«<, 'nes, *nis, is

long; as

finis.

So bulbine, anemone, confine, pene

;

eandem
ilia,

prodita partem.

qua te

Lucret.

Ter.

feire eredas, nefcias.

Momento

A

mundum;

cita

mors

nodo,

eft difcordia

fratrum.

Hor,

vinit, aut vitloria lata,

vowel before

mido, rodo,

tanta

Ovid.
Virg.
Virg.
Propert,
Ovid.

final

do

is

long

;

as vado, cedo, fo*-

teftiido.

ciido,

lijdo,

for the

;

alcedo, dulcedo, cupido, crepldo,
altitude, beatitiido, and many

nouns and verbs comprifed by

blni, lucani,

antepilini, qulni, fepteni, o£toni, noveni, deni, viceni,

this rule

are very numerous.
PoiTe putes

illas fieco

Except 'cado,

common; and

freta rtutere palTu.

Ovid.

'divido, ^trepido; and-'rudo%

which

to eat; edo, to declare, pub»
(the prepofition e being long,) follows the
"^edo,

&c.
above rule.

lifh,

1.

Multa renafcentur, qux jam

a.

Div'tdimiLS muros, et mzenia pandimus urbis.

Hor.

ceeidere, caf^fK^^iie.

Virg.
Ovid.

Ctim fubit6 trepidare intus pr^cordia fenfi.
ut Arcadia pecuaria rildere crcdas.
4. Findor
3.

Perf.

:

Virg,
Virg,

Phadr,
Mart.
Hor.

hac lege in tmihia ponetur eadam.

A vowel before final
seni,

Qirin tSnient

11.

15.

Hor.
Hor.

Aut quod me mcn^Miipendium.

10,

is

7.

3.

9.

'tibicina.

hofpes eris, nee jam potes advena dici.
Sed qui fermones ? Qvx fcrda bucc'ma fama- ?
Concurrunt trepidse cornices, dovitnamgue reccntem
Pendenteique genas, et tales alpice rugas.
Prefiaquc flammeola rumpatur ^cma caltha.
Foevuna palantes agit, atque hjec agmina vertit }
Aut hasc in noftros fabricat.i eft mac/thta muros.

1.
1.

.^

Virg,

Utque viam tenens, nulloque errore traharis.
Multa gemens, igium'iniam, plagalque I'liperbi.
Orantes veniam, et templum elamore petebant,
Neve tua Meda; I'miuntur caede fagittx.

others

nona, Luna, rlna, arena, arvTna, carina.
Hic regina gravem gemmis auro:jue

finis

So rado, credo,

as lana, vena, fpina,

;

Qua

4. Inclinata mtnent in
5. Aliquid muneat, ut
6.

nos

Except 'cano,
,

'ju-

as hippo-

6.

Ovid.
Cato.

ilia.

tonis.

ilia

in ino

qui vivit in

eft,

'cinis,

ij.almjj.xi,

chits, fee verfe 3. under the above rule.
Chrr\o{us juvenem pater excitat ; accipe ceras.
7. Hijipomanes, quod fep^ maize leg^re noverc^.

procenim tacita iibabit acerra.
Perfius.
11. Tupueriscurre,Parmenoobviam,atquehi3(mfraadjuta. Ter.
bijna pars

auditur.

*cSnis,

Vivitur parvo bhtf, cui

.

.?.

10.

rebus «wane .'

elt in

'penes,

a.

4.

Virg.

ortus.

quantum

'sine,

manes, trichomanes.

Virg.
Virg.

7. Idneeft verum.' Im6, idgrnKsefthominumpeffumum. Ter.
8. Eft qu6daiii prodire (raiis, (i non datur ultra.
Her.

l^nus ;

O

and 'nouns derived from

;

Virg.
Virg,
Perf.
Perf.

aftris.

et maiics etfabula fies.
!

^Except 'bene,

Ovid.
foles.

QuWvivis: cinis.
O curas hominum

3.

Mart.

5. Hinc radios trivere rotis, hinc tympana plauftris.
6. Fert ebaium, folis eft thurea virga Sabsis.

9. Sic

refert, et qua; furgentibus
Bis (ictias Italo texamus robore naves.

2.

'

I.

4.

Et qu2 tnSni

1.

'oceanus, ''platanus,
'ebenus, 'genus, 'tenus, 'Venus ;
bonus, "onus, "sonuE, '^tonus.
;

fo fiinis, acclTnisj

munis, &c.

Virg.

Except 'galbanus, 'manus,

Hyrapanum

cm ;

commiinis, immiinis, commiinis, im=

inanis,

Inclufumque cavo faxo, atque infueta rtw^t^nfuTn,
6. Ut ver6 eft expiilfa quies; furit ardor edendi.
5.

16.

E

before

final

rtu, ra,

rum,

is fliort

;

Virg,
Ovid,

as mfrus, he-

dera, c^terum.

The nouns and
numerous.
Ite

domum

Cenum

adje<ftives

comprifed by this rule are

fatura, venit Hefptnis, ite capclli.

ell,

io fylvis, inter tfielza/^rarum.

Virg,
Virg.

1.

Except


2. And though of anthera, eatenothêra, flâterâ, there is no poetic function, they are long by derivation from *dêrher, *sêbris, and *patra, fo pantherâ (Virg. *Aen. 8. 460.) from *dyr.

10. Qui volet *agyrhos arte ferire viros.


13. And the following in rum; *fürum, *suppurârum, 25 gârum, 25 pârum.

14. Alfo the *comounds of vôre, as carnivôrus, omnivôrus; those ending in *phôrus and phôra, from *vôre, as amphôra, canephôra, eccphôra, phôphôrus, citôphôrus, &c.; and the derivatives of *agyrhos, as hydragyrôpus, lithagyrôpus.

15. Barbâtus hic ego sum, quis non intelliger uii.


17. Pes etiam et camriter hircus sub cornibus uersus.

18. Et gravia attrita penderat cessenus centralized.


20. Seillamque, helêbôrophorge graves, nigrumque bitumen.


22. Vino ornamentis coquifque opolvis, non.

23. Praepingis terâs, apophores cogitter alro.


25. Tartâra Panhroden hicem uro.


27. Anchôra jam molâram non tenet uti ratem.


29. Troja cadet; sed eum notari inae longa laboris.

30. Per hoc brane *purpûra decuss precuros.

31. Dísplicent nexe *philîrph corone.

32. Inanumque *sûrum, aut populi tabularia visid.

33. Suppûra quantas dingent antuus locertos.

34. Prettis cellis, vêro de locis ultâs illi.

35. Maturum *purpûra cautos jam sôrpràs mendât.

36. Phôphre reddre diem; quid gaudia nostra morât?

37. *Amphiôra non semum tant proîtis mori.

18. E before final ro or ro is short; as fêro, gêro, têro.

So tempêro, aspêro, latêro, cætiôro, capêro, celêro, confidîro, deîdêro, fecêro, propêro, sêro (to sow), quôcor, &c.

Vérâm, quid facias? ut homo esser, ita merec gêras. Ter.

Except *sphêro; *allevêro and *perlevêro from *veûreus, and the adverb *sêro from sêrus; for sêro, to fow, is short.


19. Other vowels before final ro or ro are long; as vêro, *spêro, ôro, uro.

So liro, tiro, inquirô, acquiro, conquirô, plôro, labôro, suîçêro, ignôro, crôro, figûro, liurô, dîuro, and many others.

Delicûs et paniculûs bombicynus ïrît.


2. Alfo the derivatives from genitives increasing short in õris or ïrîs; as decôro, murmûro, from decus-ôris, murmûr-ûris.

So memûro from memôr-ôris; corporûr from corpus-ôris; rohoûr from robus-ôris; exaugûrûs from augûrûs; fulgûro from fulgûr-ûris; expectôro from pec-ôris.

1. Littus ûrant, Rutulôque exercent vormere colles.

2. Sed malâ via ûcis est. Lambôndo mater in auros— Ovid.

3. Quid ûris? Fuit auct quam notri tibi cura recélle.

4. Hos ut facias voles xexilloravere arô.

5. Liceat insenîrare, si incemisici non licet.

6. Quid vitam mînor invâsât, Pallante permepto.

7. Umbra, et ceo diffundere ligna pharbat.

8. Quâ òndati Calhûris culta Galaês aquas?


10. Et validas auget vires, et robroât ïctum.


So grûtus, facûtus, bôlûtus, pûtus, agrôtus, argûtus, alûtus, brûtus, hîrsûtus, mûtûs, and many others; alto participles in ûris, ûtus, ûtus, and ûtus, as manûtus, deûrûs, nûtus, minûs, metûs, conûtûs, vôlitûs, &c.

1. O fortûmus nimium, tuis quod nomen!


3. Faciâ omen, cum valerem, rectâ consilia, aegrotis demus.

4. Tûta manem; medius Tanûs surnavit in undis.


2. *Venêtus is short by derivation from Venetiz; *quûtus from *quôt; *tôtus (fo great), from tôt, for tôtus is long; and *arûbûs from arbor-arûbûs.

3. Of dicôrum, and automâtus from automâtôm, there is no poetic authority.

4. Except alto the plural genitives of nouns ending in ma-ôtas; as poemâtum.

5. And the participles dûtus, rûtus, sûtus, ûtus; for which see the rule concerning diffyllabic supines.

1. Me ûsum fàper quân vos, dedûrim vobis confiûm cûtus. Plau.


3. Et enm verûbûmûm formam cepûimus in me et jûtum. Plau.


5. Nec hâm um èllo dolor, ûd omnes ûcubat amns. Lucan.


8. Sic Fêrûs ûbanæante ûde, ûbatique Britannis— Lucan.


10. Inferiûr vero ex ëfacio naciûs ârûbus horrida. Vârg.

21. Words ending in ûtus lengthen the penultimate; as aurûtus, crînûtus, invitûs, perûtus.

Fac jâm tu, praeco, nun omnem aurûtum popûlum. Plau.

1. Except
QUANTITY.

1. Except 'anheitus, 'ceritis, 'spiritus, and 'suppiritus.
2. Also all adverbs in itus; as humanitus, penitus.
3. 'Alitus is not derived from the termination itus, but from fiatus, and therefore shortens the penultimate.
4. Alfo polyyllabic participles in itus, not derived from preterites in tert; as habitus, crctitus-a-um, and nouns derived from them; as habitus-a, and exercitus-a.

5. And the participles from the verb eo, and its compounds; as transitius-a-um, and their derivatives; as transitivus-a; the participle ambitus is, however, long, and the noun ambitus-a short.

  2. Apul me jatu et cedens fuerit feretris.  Ter.
  3. Dum mmor irge mi, dom euniprurus hos regit arsus.  Virg.

For the 4th and 5th exceptions, see the rules for polyyllabic epitheta.

22. A vowel before final 'num, 'mens, 'mentum, is long; as levamen, clemens, amentum.

So acumen, crimen, flamen, flumen, gramen, jur- gamen, volumen, argumentum, jumentum, stratum, and many others; the nouns comprised by this rule being numerous.

1. Flaminicos, caceos, crathque paludibus alni.  Virg.
  2. Ergo lance clementum variant, urbano, atque octum.  Ter.

2. Alfo 'alimentum, 'documen or documenntum, 'emolumentum, 'monimentum or monumenntum, 'regimen, 'especimen, 'tagemen or tegumen and integumen.

3. And such verbs as frémo, gemo, &c. will naturally short the penultimate of frémens, gémens, &c.

Note.—The irregularity of such words as monimentum, documenntum, &c. has been considered as arising from the fiber of the feminine or third case: which, originally, before the effect of eneoce, is supposed to have generally been in itus; as monoem, monetum, monimentum; docemo, do docemo, doctum, and by eneoce dock-tum or doctum; whence dokimentum or docteamentum, &c. But if these verbal nouns were primitively deducible from their fibers, many of them must have subsequently affixed the characteristic of the infinite present, as the e of regimen and regimen will testify. See Salmon's Stemmata Latinitatis on the terminations men and menum.

  2. Bone cubo, falls; columen verb familiar.  Virg.
  3. Vulgus Hymen hymenae vocat, fugit ille vocantes.  Ter.
  5. Atque ipse vidit nutitum a vices.  Ovid.
  7. Nullus in urbe lucus, nulla emolumenta laborum.  Hor.
  8. Hie habet, heredes monimentum ne freatuerunt.  Hor.

23. A vowel before final 'mis, 'met, 'mis, is long; as háma, limes, sublimis.

So agena, dama, fama, flama, poema, rima, ruma, sima, lupa, flama, flama, fomes, trames, illisim, cómis, cemis, declimus, decrémis, quadrimenis, quintterëmis, infæmis, and many others in each of these terminations.

  2. Exspect inviudum admoem famiile humas.  Lucan.

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1. Except 'cöma, 'cómë, 'cucumis, 'fämes, 'in
colimis, 'lacryma, 'nimis, 'pyrimis.
2. Alfo the 'derivatives' of animus and decimus; as anima, examinis, decima or decúma.
3. 'Déynâmis and 'endymonis have their penultimate regulated by the Greek short a and ã; as éuynámos, ëndynâmës.

  3. Curvarus cucumis, tumultuque curcius ventre.  Hor.
  4. Fecit; et incolumis lector quidvis cath in urb.  Hor.
  6. Fortuna multis du nimis, fatis salis.  Hor.
  7. Non mihi pyramidum tumulis eva Amo.  Lucan.
  11. 'Dynâmës domi habent maximum.  Plaut.

24. I or Y, or a vowel derived from the short increment of the genitive, before final nó or mor, is short; as animo, actimo, decimo, lactximo, and hiemo from hiëmës.

Quo redit ad falsos, et virtutem affectam amis.  Hor.

Except 'lismo and 'rimor.

1. Límot non ad obscuro morfique venenat.  Hor.

25. Other vowels before final nó or mor are long; as clámo, nómo, prómô, símô.

So fámo, fámo, têmo, dêmo, postrémô, fímo, írumô, fímø, rímor, &c.

Exspect et longe lapsum témone relicuit.  Virg.


1. Votum in ènumante novum; vellem, quadèmuesse sheflet.  Ovid.
  3. Atque omne ornamentum, fammæ crepitante, crémori.  Virg.
  4. Non annuam dincere decor, non mille carinae.  Hor.
  5. In quis: sint cibara, emptus comoritc in unum.  Hor.
  8. Hómo sum; humani nihil à me alienum putt.  Ter.
  9. Égnot; príte ille graves intertiss un,  Lucan.
  10. TEMPLUS CONSONTA TRINIT, 'frém textStyle noventur.  Lucret.

Note.—'Como-ère follows the general rule; but 'como-ère, a verb seldom used, shortens the penultimate: both are derived from cóma.

26. A vowel before final lo or lor is long; as cálo, célô, pilô, sölo.

So háló, málo, vélo, sólo, nólo, pálo, sólo, péculor, &c., and several others.

Excepta, ac fóluis opibus 6tacutus amicis.  Virg.

1. Except 'talo, 'tóló, 'tóló, 'ventilo, 'vóló, and 'cólo-ère, to cultivate, but 'cólo-ère, to filter, follows the general rule.

2. Alfo the penultimate of 'consulio is short, from consul-úlis; so 'géléo from gelu, and 'affiimo from fínilis.
3. Except alto "verbs in uto or ulor, which are generally derived from diminutives in ulus; as circulo, circulor, from circulus.

1. Tutus et geminos anxia mater ditt. 
   2. Et color extremus primo cum frigore mixtus. 
   3. Mille tremans varias adverso solis colors. 
   4. Pils usque, tardoque gerint in bella vindus. 
   5. Materiemque dlire, levare sae cladea. 
   7. Milendum utique in pitritim; vapsulandum; habendus compades. 

27. A vowel before final 'bes and 'ges is long; as nubes, ambages.

So labes, tabes, pudes, compages, impages, irages, fruges, &c.

1. Sub pedibus videt nubes et fides Daphnis. 
2. Jam dareturam dat plegem atque exigent ipsa. 

Except 'hebes, 'indiges, 'labes, 'seges, and 'tenes.

1. Uteque hecetpt peccus tantummodo contidit rinem. 
2. Fiat patris indiges et Romule Vestaque mater. 
3. Tertia domo geminos ex mel loebet. 
4. Illa fides demum votis respondet avari. 
5. Infltor hyberne tegitis, niveque cadere.

A vowel before final 'des and 'pes is short; as fides, tipes.

So analeides, anterides, hyades, pleades, swords, and all maculate patrilineous, according to the first rule; so alfo apes, dampes, tropes, and the following compounds of pes, bipes, tripes, quadrupes, centipes, antipodes, celeres, grapiapes, alipes, lepives, fo-nipes, cornipes, ignipes, longipes, loripes, palmipes, solipes, capipes, &c.

1. Mens bonis, fama, fides, hae clar, et ut audiet hapes. 
2. Infratrem alipes pitique 'tigetis.


2. And though we are without poetic authority for careinodes, caleodes, horminodes, yet their penultimate is evidently long from the Greek; so epodes; as 
   3. curpore, coquore, lymbribus.

1. Claritas irruimus nocturne prorida arma. 
2. Dutx et inferans permulta inerita sedes. 
3. Illa, velut pelagi ripes immo refintit. 
5. Spondeus datur subinde sudebatque praetis. 

Note.—The elided existence of triades seems not to be satisfactorily proved; Aldworth and Facitichian cite only one authority, Tert. Ann. 24, 4, where commentators propose voices, as a better reading.

29. A vowel before final 'dix, 'dix, 'lex, 'mex, 'nix, or 'rex, is long; as codex, radix, iles, cimex, imum, caxex, carex.

So judea, lodix, spadix, halex, pulex, pumez, remex, tomex, remex, muez, toxex, &c.

1. Inde porr sb putem, utque ad robudum sedicem. 
2. Prorint ab abreede eredire redditus. 
3. Prevenient preae, inter keta sequitur eix.
35. A vowel before final *sa* is long; as clāva, proclive, dives, civis, pāvo, rīvus.

So cāva, conviva, divā, ginīgā, pāva, praeogativa, ūva, xēlīva, olīva, conclāve, nēva, clāvis, fulāvīs, nāvis, rāvis, acclīvīs, declīvīs, procīlivīs, vívo, prāvo, rīvo, nīvo, prīvo, xēlīvo, ēxāvīs, ēxāvīs, divīvīs, ōvum, prévūs, and all adjectives ending in īvō, which are numerous.

1. Duceret apricis in collibus ëxīs colorem.
2. Turre crērē per totum pandit conélēre magιquē.
3. Dīves aget, dīves politos in ūnīs numerus.
5. Úberēs os, altum virtūs, sēculum virtūs.
6. Tam fēā prūνīque tenes, quān nuncia veri.

1. Except lāvis, lēbris, ērāvis, lēvis, ēvis, óvis.
2. Allo cāvo, grāvo, jūvo, lāvo, lēvo, nóvo, óvō.

3. I. Except *ās*, *ēs*, *ēvus*, *ēvīs*, *ēvum*.

1. Fiet aśer, modō āvīs, modō ūnām, et, cum volet, arbor.
2. Vīce summa būrīs spēm nos ventā inūnāre longīnum.
5. Íntūruit, Pan carūr ūves, ëxīmōque maγiōs.
6. Dura tamen mōllī ĥaex èxācēt quādū.
7. Unde grētēt perennes; ët celēr īgūs adārāt.
8. Temporēs celli, corpūsīque, animāque jōvītūat.
9. Ìnpes, pāta, cano, lūdo, lāvo, cano, quīscīo.
11. Nēc remorgūtūr iēs; ëxīs rēum ūmītāt quārtā.
12. Quo nūn Turnus évit, fōpolo guéterque potius.
15. Mēlā fēās, illī tūlaque ætūbe uērinās pīnas.

36. A vowel before final *ē* is long; as ēpica, formāca, seūtica.

So antica, apica, cloaca, carrūca, currūca, erica, mica, myrica, lactīcā, lectīcā, noctorīcā, ricā, ru- brīcā, lūcia, pātīncā, phōcā, famībīcā, sīcā, urtica, velīcā, &c.; and several ending in ēpha, from apōtica, bibliothēca, oropothēca, &c.

Parvula nam exemplō cf., magnī formācia laborīs.

Except *ālica*, *ēbraica*, *ēflīca*, *ēmanīca*, *ēper- tica*, *ētūnica*, *ēflarīca* or phalarīca*, *ēdica*.

1. Nos alecam, nullum poterit tibi mittere dīves.
3. In ūcō humātum sūlīs, notāque palude.
4. Manticō cum lumbūnerea uērēt, atque equēs ārōs.
5. Perīvōs dat plēnī inūmitāt ulnūre rāmīs.
7. Sed magnōm ūlīudent contorsa fēlāricā ventī.
8. Cēd dam, unīquām injūnārum ēudūlī mi scriptam ēdēm.

Note.—1. Alphabet is rather alphabetēs cf. απεικόνισθαι, and therefore does not relate to this rule.

2. And since adjectives in ēcus shorten the penultimātum; wherever the termination ĕcūs is derivable from an adjective in ēicus, though the adjective itself be not in ëve, the penultimātum is short by derivation; as,

Plutarchus from plātarchos; i.e. an oikōn πλαταρχος.

Fabrica from fabrica; i.e. oikōn oikē fabra.

Flaminia from flāminia; i.e. oikōn flāminus flāminia.

Manica from manus; i.e. vēlis manus manica.

Pedica from pedica; i.e. comē pedica pedica.

Lucania from Luκanciēs; i.e. oikē Lukanorum lucana.

Bucclia from buccclia; i.e. καρκίνων κουκκίνων bucclia.

Basilica from bāsília; i.e. καρκίνων βασιλική vel bāsilia.
37. Words ending in *aris or *are lengthen the penultimate; as alāris, altāre.
So agricola, peculiāris, nāris, alveāre, capillāre, plantāre, quīrē, and many others.
1. Suspicium, patulius captavit nābibus auris.
Virg.
2. Suspecti exigit lactum plantāribus hori.
Juv.


1. Oderant hālāre tribus, trātumque pessō. Hor.
2. Aut Ephestum bimariōs Corirhi. Hor.
6. See, ser dāre, the verbal increment in *āre.

So crūdēlis, carduelis, patricius, cædēla, loquēla, quercēla, corruptēla, cīciēla, clientēla, macliēla, si-tēla, Phīmēla, parālēlus, polymiēus, aerenōlis, forōmis, hērōitis, pernicīōsis, nīdus, crīdus, fūdus, and many others.
1. Nuncum est fidēlis cum potestate cīciēsis.
Phēdr.
2. Et circūm plius vehitur famīra Phīmēis.
Virg.
3. Quīs populās cæsāres Phīmēis fūt ubās.
Virg.
4 & 5. Cādeque fūsiōnem sēmum cēsis.
Juv.
6. Quōd Nero tā saevā, crūdelegu tyrannus fēcit?
Virg.
7. Hinc altūb tuēse cānet frontētār ad aurās.
Juv.
8. Nec fōcās fecit; sātor tamen eī fāpiam. Quī—Hēr.

39. Words ending in *uber, *ubār, or *ovār, lengthen the penultimate; as Octōber, faēbār, pāpāy, &c.
So fūber, tūber, ūber, hūber, pūber, cædāver, &c.
1. Te caepe, Octōber foretiae aetēs.
Aurōn.
2. Quīque frequentes hērībus et férībus ūber campus.
Virg.
3. Līlia parupres miēs popīvāriō sis.
Propus.

Except *coluber and *tubār.

1. Inque praimūne colōber dūnterīrīs aero.
Lucan.
2. Crīne rītōr, nigētore, brevi pēde, lūmine lēxus.
Mart.

40. Adverbs in *im lengthen the penultimate; as oppo-dim, virītim, tribūtim; except *Ramim.
1. Et velat abfemem certēmō Aētēsōn clamant.
Ovid.
2. Nec spērnat aurā, nec tamen cētātim fidēlātum.
Plurīd.

Nota.—" Nōria Lexēria, Graduātum ad Paras. Penultimam adverbii, effātim, longā spēcīs fīgunt. Nec eo inuis, quin poētae degeneris Latinītis eam producētur." Vide tamen Lexēria Faccīleī, ubi hanc observationem inveniēis. "Augustīnus poētā, suād Gel. l. 7. c. 7. suā dīgōtīa de quānta militēs, ut fā-
tūs eam εηεworth από την ρήματι: inuētum autem, cēm eam producēt succīs; qual et αρi矜e factum erit. 1. 2. in Ac. Apōsē. v. 616. Verum non est hoc fāsis, ut contra communem uēm patērī copiēt.

41. Words ending in final ques are compounded with aquae, and therefore lengthen the penultimate; as antiquae, inquae, oblōquae.
Terra antiqua, potens armis atque ubere glēbae.
Virg.

Except religius, which is not derived from aquae, and is therefore excepted.

Tercētīrī quies tēcēta paēde tībī.
Mart.

Nota.—"Though the real cause of the penultimāte of inquae, antiquae, &c. being long, is the contraction of the a. of quae, from which they are derived, into i, which is therefore long, according to the rubr we have given for contraction; yet since the above may be a more obvious definition than a Latin cause, we have not thought it improper to add it. And since this remark is applicable to some other terminations and examples, noticed in this analysis, it is sufficient here, once for all, to give this general answer."

42. Words ending in polu, or polium, being derived from polu, lengthen the vowel before l; as bibliopola, ceiopōlia.

So myropōlia, myropolium, propōlia, pharmacopōlia, &c.
1. Sed quia me vendit Bibliopola putat.
Plaut.
2. Nam omnibus plateas perpetuas, gymnasia et myropōlia. Plaut.

43. Words ending in arei, arius, erium, orius, lengthen the antepenultimate; as pāreco, cibārius, acro-
ērius, mefōrius.
So āreco, clāreco, hordērius, fēctārius, libārius, mercaenārius, herbaerius, capillērius, dictērius, cecel-
fidērius, nictēriūs, sphaerōrius, adulatorius, cenōrius, and many others.
1. Vīm germinam setit, pōrebque incerta duobus.
Ovid.
2. In hunc diem jam umns fūm mencherōrius.
Plaut.
3. Omnibus arīdes, dēxōria dicis in omēs.
Mar.
4. Quibus evrēos cum meō ferrō.
Mar.

1. Except *cīreco, *vārius, and *neētēreus, from nectārius.
2. Alfo *defidērium, from defidero; *maigērium, from magillērīum, and *minētriūm, from minētīlīrīum.
3. And the *derivatives of genitivus increasing in short āri; as aquēreus, arēreus, caēreus, corpōreus, ebūreus, marmoreus, ferrōreus, robōreus, from aquor-ōris, arbor-ōris, caelō-ōris, corpus-ōris, churōris, marmor-ōris, ferrōreus, robōreiūs.
4. Except alo some *derivatives from *omērōneus, as boreus, anthōboreus, hyperboreus, from *ēgéneo.

1. Siliciēt et mērinis et deśillatē cērēcis.
Juv.
2. Ex fērūrās aedificando exsūs tāria.
Virg.
3. Antē nērōnibus turbae medē fālēremon.
Mart.
4. Roma, dominique subit, defidēriiis locorum.
Ovid.
5. Vīnent, id factum, tu, et mēsēgēriu tuo.
Plaut.
6. Fēlīs mēnērēiis mulcas, parāpētis laborīs.
Ovid.
7. Arērobus būndās annus rasiātēs nuncē.
Virg.
8. Vīs poelo patriī pennūreis sāsī acē Rēcia.
Ovid.


So arēneaeus, hērēaeus, hordēaeus, refīnacēus, cretacēus, ariēnēus, condītēnius, rejectēnius, collectēnius, bipedēnius, and many others.
1. Herēbus nērōrius refīnacēus terra.
Var.
2. Prōneus et ingratae presentem effiūs urbi.
Virg.
3. Nec neulānicius nōvis, queru arēnōs terra fālē.
Lucrēt.
4. Si rectē facies, hēc manu aŭtōrus ēo.
Hor.
5. Oppositiono maētēs eōne saēcēs sēmēnēs aŭtōbarius.
Lucrēt.

1. Except cālēaeus, from cālēaeus.

Cālēaeasī quēs, maēs quēs Amārīlica amatē.

45. Words ending in icīus, icium, or iūtus, shorten the antepenultimate; as patriicus, xēdītius, cēdītius.

Patricius omēs ophōpōs cēm provocēt umās.
Juv.

So gentīcius, tribūniicus, adventītius, fācītius, auspūlicus, judicīcius, artificius, aruspilicus, malefic-
ius, beneficius, opificius, extipīcius, harrūpīcium, xacīcius, indicīcius, officiuis, macefīcius, and many others.
1. Except *novicius, or novitius; and those which come from long ūpiones; as efluitiūs, from eflitius, ire, iūtīmum.
2. Alfo *convicius, *licium, and *nutricium, from nutrixt-icis.

1. Jam fede in ipis tertiumque mācēus herret.
Juven.
2. Nēve in me frēude conquītum erē lingue.
Ovid.
3. Et prōfāne damāte bōves, et fēria tērē.
Virg.
4. Omēnis ināntum maxī nutrixtī tūba.
Marti. 
46. Words
QUANTITY.

55. Y before or after R, is long; as Butyrum, collyrium, papryrus.

1. Collirium facetiae ut madeant et collipa.
   Plaut.
2. Succinctius patruam Crispine papryrus.
   Juven.
2. And the derivatives of ージューパ; as hydrargryos, lithargryos.
3. See the 3d exception to the last rule.
   1. Et lacrymis fargunt ramulibus ora genaetique.
      Lucret.
   2. Sit tibi Mula lyrae folos, et cantor Apollo.
      Hor.
   3. Neve inter vitis corlyum fere; mere flagella.
      Verg.
   4. Ebphes inclinat philryra conviva capillus.
      Ovid.
   5. Infere nunc, Nobilibus, püryos poised online vites.
      Hor.
      Hor.
   7. At vert Zephyrum cum luta vacantibus sibi.
56. U before or after R, is long; as lúridus, uro, rúmor.

1. Neplethis Grenda filis infatuarique.
   Hor.
2. Quar vos ad celum effeas róneum secundo.
   Hor.
2. Except also ri in 3 genitives, increasing short in 3 is or Æriis, and their derivatives; as crux-cruciáus, truc- trucis, augur-úris, murmur-úris, fulpur-úris, which give crucio, trucido, murmúrio, augúris, fulpurís, and the like.
3. Alfo, 15 meditatives in Ærio and luxúrio; as estúrio, 17 other verbs in Ærio follow the general rule; as ligúrio, facetúrio.
4. U before final r, and ru followed by a vowel, are regulated by the rules for those circumstances; as augur, fatur, rúno.

1. Prae torqueat fìamus loco cëftra cërulius.
   Lucan.
   Virg.
3. Quod férius? Aut quonam nofitris tibi caereref? 
   Hor.
   Phaedr.
5. Nocturnos lemnere portantque Théfæla rides?
   Hor.
6. Cinéasteque ad vitam matrum immoquique easter.
   Ovid.
7. Et muneram querellae caucis doloris abepit.
   Ovid.
8. Quem dilcere Chasus; rúsibus indigenaete males.
   Ovid.
9. Infecit diversaque viribus, fulpurique rüdium.
   Virg.
10. Porríceus inceúa poíns Aurora rüdium.
   Hor.
11. Robor complexus réditius curvas metallo.
   Lucan.
   Plaut.
13. Pauperis et tugurii emendum cepite cadem.
   Plaut.
   Hor.
15. Vultus in unum me treceus.
   Hor.
   Hor.
17. Tractavit cædium manibus, dum furta ligíria.
   Hor.

57. 'O and 2 'U, before m are long; as vúmer, búmer.

1. Ingemere, et solen attritus flendendé ete vúmer.
   Virg.
2. Quæque fætus fríus trés marais fregere vicum.
   Virg.

1. Except, to o before m, 'cóméa, 'cómédo, 'ómítio, etc tómacum.
2. Alto atomus, domús, glómus, tómus (for which see feét. 2, rule 5); coma, cómes (for which see feét. 2, rule 23); domo, hómo, and vómo; (for which see feét. 2, rule 25.)

1. Non focus ac liquida & quando nolle cémétin.
   Virg.
2. Ut libet: hac porcio hodice cõmedendo tehunque.
   Hor.
   Hor.
4. Quo modasiam qui bránda rausus.
   Mart.
4. Alto, colímum, docúmentum, emolímentum, te-

 génem (for which see feét. 2, rule 22); húmus, polútumus (for which see feét. 2, rule 5); cebúmis (for which see feét. 2, rule 23); and autúmo; (for which see feét. 2, rule 25.)

5. For circuneco and circumago, see the rule for m.

1. Quod cum velit, homo, crimenam fili de collo detractit.
   Plaut.
2. Exhaustrum in cælem omnique in spectus suntema est.
   Lucan.
3. Ipse nihiló hómeros: see me l. bor ile gravat.
   Verg.
   Plaut.
5. Rari quippe levis, números vis sunt totem, quos.
   Mart.
6. Alìo fimul de lingue, confereos súmus.
   Phaedr.
7. Ignea monte ecalis, corpus et omne venene.
   Ovid.

58. U before e is long; as búcua, dúcio, caducus.

2. And in 4 genitives increasing short in 3 is or Æriis, and their derivatives; as dux-decis, crux-decis, trux-decis; hence crúcio, trucido, etc.

1. Quod puré tranquillus; homo, an dulce lucrículum.
   Hor.
2. Hec ego non credam Venefina digna iudicem.
   Juv.
3. Mals daria, nuciculeque jubet, dulceque placentas.
   Mart.
4. Interca volucere noics concernita penises.
   Petron.

59. Syllables indifferently spelled with one or two consonants are long; as literae or litterae, litus or litius, cúpa or cuppa, púpa or pulpia, flūpia or fluppha, fricoma or fricima, flúpia or fluppus or flupphos, clépium or clélium, which should invariably retain the double consonant, since it is by position alone that they are long, by the consonant, and not by the vowel, reduplication.

60. Syllables indifferently spelled with a single vowel, or a diphthong, are long; as teda or tæda, præhum or prælum, which latter orthography, the more expressive of the vowel quantity, it is better to retain.

61. Vowels derived from r, s, r, s, are long, as hirius, Sirius, músa, from μ, γ, γ, μ, μ.}

Note. — Many of these are already compiled under the preceding rules; the principal words referred to alone to this rule, are colón, crístern, hépar, hépòs, lepithus, lúchen, cede, rétrus, spézium, ðáerus, thórus, thorésis. To these we may add near 200 words of very rare occurrence, chiefly signifying plants, herbs, flowers, minerals, &c. &c. as ambelidus, ambelipa, ambelino, &c. Of these we would here insert our manuscript list, but since they are principally confined to such authors as Pliny, Celsus, Vitruvius, and Frontinus, they are matters rather of occasional reference, than of any grammatical rule.

62. Some words alike in orthography, differ in quantity only according to their signification; as

1. Póplus abó
2. Erit, nort et populus
3. Plebem, sic múlús est pro
4. Prævo; signt item malmum.
5. Návia mulus; nélina málus,
6. Strípe uno producit plúma. Múla genem vult;
7. Múla pona, Et plúus
8. Facciones pálidas; et feré
9. Stágnam lásueve, at non tamen sic
10. Pólus notans súdem. Nítor, nitentûque,
11. Nítentûque niter et nitentís sèchís,
12. Proténine solum; non ita solus aut
13. Ab eo sochú. Pía nótone
14. Rectis et eae corripit; licet
15. Verbitis aut vice vulneriis, tu
16. Exstihhitas plúgim. Pías de in globulo léco
17. Centralitupric: mole
18. Denutati, persegé pilum? notat atque pilus
19. Acei fóem mulique;
20. Et pilum quoque, maffarlare tejí.
21. Nítor, nómor, non Ére, Et notas cóndere
22. Cacériae gerere; sed cóndere orsre est comun.
23. Celláre aquas non dicimus; jí led colori orva, nóra.

Note.
QUANTITY.

Note.—The above verses not only furnish the words relating to rule 62, but all, to unite two objects in one; they at the same time afford a specimen of all the Horatian metres, which, to the classical student, may prove a useful compendium. The exposition of the second, probably, only the second production of the kind in print. The subject is spoken of by the two editors of Horace, Cracquius and Baxter, and, had it been more than a question of the subject, the present would have been impossible. In the Horatian metres comprising this specimen, the reader finds for the first time in Latin, the Horatian Primus, ed. [4th] page 246, or Versification, in the sequel of this work. The following, however, are the Horatian metres, as exemplified in the above lines: 1 An Adonic; 2. A dactylic pentameter; 3. A Pherecydian triad; 4. A Glycic choriambic; 5. Dactyl hexameter; 6. An hemistic aecopalous; 8. Iambic dimeter; 9. Iambic meter hypercaletic; 10. Iambic trimeter elastale; 11. Iambic trimeter; 12. An actepolad; 13. A Sapphic hendecasyllabic; 14. A great Alcece; 15. A small Alcece; 16. Alcece choriambic; 17. Choriambic dimeter; 18. Epichorichoric tetrameter; 19. Ionic metrierchimer; 20. Sapphie ionic; 21. Ionic meter trimeter; 22. Dactyl heptameter; 23. First elegiastic Archilochian; 24. Second elegiastic Archilochian. The remaining words alluded to by rule 62, are comprised by the following hexameters.


63. A vowel before a sungle consonant, not affected by any preceding or following rule, is short; as sapio, singula, gracilis.


Note. To confine the preceding rules to limits as short as possible, is, the preceding rules and their exceptions relate only to words of pure or Augustan Latin. Some terms of very rare occurrence, chiefly the names of plants, herbs, stones, fofli, &c. near 300 in number, are omitted, as matters of occasional reference, rather than of constant attention or grammatical rule.

We have now, after four consecutive analyses of the language, for the more complete information of the student, accomplished a task, perhaps never achieved before, nor so far as we are acquainted, offered to the public, in any profitable system. And we can venture to affirm, that any person was acquainted with common proedy, and the rules of this section, will not, within the precision of Augustan Latin, find a single word, except the few of rare and unrequent occurrence mentioned above, whose quantity is not regulated or accounted for by the rules now given. Thus, for the first time, we have endowed the majority of Latin quantity, by all preceding professors returned to a court of observation and practice alone, to a regular classification and system. Would our limits permit, we would here, for the sake of exemplification, take the words comprised by any letter of the alphabet, and account for the quantity of each by the principles and criteria we have here considered.

It is almost necessary here to add, that the quantities of syllables are marked with very frequent inaccuracy in most of our common dictionaries. The poets are the only satisfactory test.

SECTION III.—On final Syllables.

1. A final, in words declined by cafes, is short; as fama, regna, lampada.

Anchora de propria jactant: tant litore pappus. Virg.

1. Except the ablative singular of the first declension; as hae mufa, hoc AEneas.

2. The vocative singular from Greek nouns in ατ as O Palli, O Atil.


2. A final, in words not declined by cafes, is long; as amf, ultra, praeterea.

1. Lutus amf et levius Anagis fine palmis cutes. Virg.
2. Incredibili magister marmure pantum. Virg.

3. Except ita and ej short, and pollea common.

4. Quia is generally short, but since Phaedrus lengthens it, we may pronounce it to be common.

3. Some profoundis quote puta, with the a short, from Perihus, 4. 6. But the belt editions have puto, a reading evidently preferable, in point both of sense and grammar.

4. Though numerals in ginta are sometimes found short, approved authors lengths the a; yet it may be well to recollect, that the Greek termination KONTA, whence the Latin ginta is evidently borrowed, has the final vowel short; as

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(See many other instances in [B] B)

6. Tum ce accipiendum regem, acce et il se turbidus int. Virg.
7. Si auxilarum postulat degeat. La., ibam.
8. Postulat mirabil, cur non in fine itin his effet. Ovid.
10. Ego primam tello, nominem qui lex. Phaedr.
11. Sensum terna cum limina, name fenacer. Mart.
QUANTITY.

3. E final is short; as nate, patre, curre, nempe, ante.

Incept, parte, puere, ruis cognoscere matrem. Virg.

1. Except that final E in all cases of the 1st and 2nd declension, is long; as Callippe, Tydide, Anchis, idd; also fam¢, originally of the 5th. Thus also, rE, dE, and the 3 compounds quare, hodid, pri- dil, poltride, quotidid.

2. Alfo in all nouns wanting the singular; as cet, melk, temppe, pelage, Greek neuter plural.

3. The second perfon singular of the imperative of the 5 second conjugation, has the E long; as doce, mon; but cave, vale, vide, respone, and false, have e common.

4. Monofyllables ending in E are long; as me, te, ne (left or not) except 1 enclitics and syllabic adjectives; as quE, ne, te, te, te, te; as neque, quE, fuape, hujufe, tutE, &c.

5. Adverbs in E coming from nouns of the second declension are long; as placid, pulchre, valide or vali- de, &c. Except benE, melE, superne, inferne, mage.

6. Ferne, fere, and oh, have e long.

1. Hane tua Penelope lemo tibi mittit, Ulyxif.

2. Ec tuaquum fanc pervert rhodica, rhodica.

3. Hor. Quae mens ed hodie, cur eadem non puerum fuit?

4. At pelage multa, et late tibitrua videmus.

5. Vide, valE, carE ne tinhe, mainuque fragans.

6. Idqaque, quod ignoti factum, nati dicere falcem.

7. Responde, quibus-amisse reparare quam res.

8. Si quando veniet dicte; responde, poeta.

9. Quod dies nata vide, nisi te quoque decipis ipsem.

10. PuE, ne dolue column componam tibi.

[See alfo Perk. t. 108.]


13. Vera, quaesum; neqE me Argulke di gente negabo.


15. Nati bene cum facis, facia attem inomnia belle.


17. Mobius et vari et fernE natura mahrurn.

18. Jocunque ferrato, fabulacum laetere puppE.

19. Impurumus, cum arti ludefi donum ebe: jam.

Hor.

1. Final is long; as domin, clasii, fieri, doceii, audi, ili.

Old respondit rex Albus Longui.

1. Except the of Greek vocative; as Alexi, Amaralli, Theii, Paru, Daphni; but Simoi, or such as belong to nouns having entos in the genitive, are long.

2. Greek datives singular of the third declension, from nouns increasing, are varied. Minorind and Te- thy in Catullus, and Palladi in Statius, are short. * Thetidi in Catullus, and Paridi and Tyndaridi in Prop- ertius, are long; but Greek datives formed by con- traction are always long; as Demostheni, metamor- phosi; alfo those which come from the first declension in Greek; as Orelri, Euripid.

3. Neuters in i are also short; as gummy, mei, fnap.

4. Datives and ablatives plural of Greek nouns in 5 (in before a vowel) are short; as heroes, Peru.

5. Mii, tii, ri are common. Alfo ibi, nii, ubi and qual; but these lat are more frequently short.

* Note.—These may be long by poetic licence, or by position; for the i of Greek cafes is naturally short. Orph is may be considered as a dative in Virgil, Eel. 4. 573; and by genet is. It is a fuppose in the Georgics, 4. 535 and 555.

1. O crudelis Altei, nihil mea caritatis cura.


3. Troian invideo, quae baturin florum.

4. Non unquam gravis erat domum mihi dextra redit.

5. Extremum hunc, Arachne, mihi concedi laborem.

Virg.

5. O final is common; as quando, Cato, leo, abmo, octo, amo, doceto.

1. Armo annua venis, nos in locis in armis. Virg.

2. Non utcumque, faido; nec potion dicere parte. Mart.

1. Except monofyllables, which are long; as o, pru, du, fi, and pru, b not being accounted as a letter.

2. * Greek feminines ending in o are long; as Dode, Sappho, Chlor.

3. O final in datives and ablatives of the second declension, is long; as homno; to which add another ablative, as ergo, for the sake of, ergo therefore belonging to the rule.

4. Alfo * Greek cafes, written in the original with ome; as Androse, Atho.

5. Adverbs formed from nouns have the final o long; as hubito, merito, multo; and illo, quo, e¢, and their compounds. Alfo eir, intro, retr, ulprio. But the following are sometimes found short, denio, idec- o, fero, protefto, poftremo, the conjunction vero, po, to which fome add fedalio, crebro, and mutuo. * Modo (used adverbially,) and its compounds are short; as quomodo, dimmodo, poftmodo.

6. Though the final o of verbs, occasionally by writers of a secondary clafs, and more rarely by tho- es of the Augulian age, has been made sometimes short, yet its derivation from the Greek omea, and the more general practice of the principal ports, make it long: the 6 of feio, inefio, putio, cito, and of the imperative cedo, only, are generally short.

7. The gerund in do, in reality, being nothing else than the dative or ablative of the second declension, is, accordingly, by all authors of the Augulian age, made long; the 6 exceptions to this rule are very few, and only by writers of an inferior clafs.

8. * Ambo, duo, imo, illico, ego, generally shorten o final.

1. PrE meli viol, pru pargadtv aracico.

2. Citique, et Berio foror, oceandis ambo.


4. Addo, quod ute tus, nem præsa prænna.

5. Quoque alio titr, que tu faci igitur timean?

6. Hiero grammaticum ostium chorambon.

7. Hiero certis dimum pennis iberum.

8. Imperiali habero datu: viato velox.


11. Velit perro labor faccedore historiisam.

12. Hic inter dens corum mundi maxime genesices.

13. Floridae Komulae errantia pango duciam.


15. Duree quaque fortissima, ha mihi juris.

16. Se ubi nemes quis 4 sero de gente vimorum.

17. One nati, modi tihc velo mihi redeere.

18. Praterex duo atis tuu mihi valle repertii.

Virg.

Virg.

Virg.

Virg.

Virg.

Virg.

Virg.

Virg.

Vrg.

Virg.

Virg.

Virg.

Virg.

Virg.

Virg.

Val. Flc.

Juv.

Juv.

Juv.

Hor.

Ovid.

Hor.

Ovid.

Aven.

Virg.

1. Inde.
1. Indiē manu validas potēs ēt moderantem habebas. Lucr.  

Y final is short; as Moly, Tiphý, Chełý, Tetřý.  
Moly vocant supēri. Ovid.  

Except when y is a contraction, as in Tetřý, instead of Tethyn, the dative, it is long by the general rule for crāfs.  

8. Latin words ending in B shorten the preceding vowel; foreign words lengthen it, as ab, ob, Job, Jacob.  
Magnus ēō integro fec'lorum nācitur ordo. Virg.  

9. Final C lengthens the preceding vowel; as āc, sic, hic, (adverb), dāc, illic, &c.  
Sic ocūlos, sic ille manus, sic ora ferēbat. Virg.  

1. Except that nec and donec are short, as also the imperativē facē.  
2. Hic and hoc of the nominative and accusative, are common.  
* Two passagiæ quoted from incorrect copies of Ovid, to prove facē long, in better editions appear fācē and fāce; to that, according to the opinion of Alvarēs, it is safer to consider facē as short.  
1. Parē, nē invēdē, fine mēq, liber ībi in urbēm. Ovid.  
4. Hic vir, hīc ēst, tibi quem promittit faelect āudì. Ovid.  

10. Final D, in Latin words, shortens the preceding vowel; in foreign words it lengthens it; as quid, ād, apūd, illūd, sēd, David.  
Ipē docet quid āgām. Fās ēst et ēb hoste docerē. Ovid.  

11. Final L shortens the preceding vowel; as mēl, fel, pōl, fēmīl, fēmel, nihil, consûl.  
Innocē veniant: procul hinc, procul impius ēfō. Ovid.  

1. Except that Hebrew words are generally long; as Daniel, Nabāl, Saul.  
2. Sāl, fōl, and nil, are long.  

12. Final M was, ancīentē, short, and was not, as now, elided when followed by a vowel.  
Indignāta fērē tum millīs mīlitium ēō. Enn.  

It is short in circum, in composition with words beginning with a vowel, as circumcē, circumcauto.  
2. Quōs ca circumcētās fē quārisinga aut ultimās pōsās? Juven.  

13. Final N lengthens the preceding vowel; as ēn, plēn, quin, nōn, sīn, rūn, Pān, Salāmīn, Ōrōn, Titān.  
Mērēs et ardentēs Ōrōn auremignēs. Manil.  

Except nouns ending in 'en, which have īnīs, short, in the genitive; as carmen-īnīs, tegmen-īnīs.  
2. Āllo nouns in 'en of the singular number, from the Greek ο (omicron), and which, in Latin, are of the second declension; as Hōn, Pyōn.  
3. Nōs is short in the accussatives of Greek nouns, having the final syllable of their nominative short; as Mājān, Āgīmān, Orpēhōn, Alexīn, Ibīn, Chēlyn, Ityān.  
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4. Allo ān, ēn, forsan, forsitān, tamēn, attamēu, veruntamēu, vidēn, fatīn, have n short.  
1. Addūnt et titulī, titulus brevē etamēn habebat. Ovid.  
2. Laudābant alīs clarēs Doutōn, aut Mutēlēn. Hor.  
5. Forsētēn et, Prāmi fuerint que fāta, requīrās. Virg.  

14. Final R shortens the preceding vowel; as vīr, puēr, tēr, timōr, calcēr, Hamilcār, anāmār, audīuntār.  

Tum pōsēr omnīpotēns misīò perfērīt Olympum. Ovid.  

1. Except 'G Greek nouns, and 'fīnch as have ērīs, long, in the genitive; as crāter, Sätēr, vērē, Recīmer, 'Iber-ēris; but Cēlibēr, the compound of Iber, has the penultimate common.  
2. Allo 'ār et atherē, though they increace short in the genitive.  
3. And 'ārēr, 'ārē, 'ānēr, 'ānē, 'ārēn, 'ārēn, and with its 'compounds, compār, impār, dispār.  

2. Vēr erat aestētum, placidēque tepentūs aurīs. Ovid.  
3. Si tībi durus lērō, aut si tībi tērēs deśitēs. Lucan.  
5. Ducēt ad aurēris quēd nēs nālo Cēlibērīr ēras. Mart.  
10. Multā quidem dīxī, tērē cæstus abstēres. Hor.  
12. Ludērē pārērīr, impārēr, equīrēt in arundēne longē. Hor.  

Note.—Cor long is attributed to Ovid, but the line in which it is fādē to be found is thus found, is differently interpreted in editions; the same remark is applicable to virē as  
2. De grēge nunc tībi vērē, nunc de grēge natūs habēndās. Ovid.  
3. Thus corrected, virē is long merely by position.  

15. Words ending in AS, lengthen the final syllable; as mās, vōs, crās, fās, amās, farās, pītās, Thomās, Mūfās.  
Hās autem terrās, Italīque hanc litterās orān— Virg.  

1. Greek nouns in as are short, which make the genitive in adōr or adīs, as Arcēas, Pallas, Lampās, Ilās; to which add the noun Annēs, and Latin nouns in as, formed after the manner of Greek patronyms; as Appīs.  
2. Allo the final as of Greek accusatives plural of the third declension is short; as crāterēs, lamīpās, Troēs, Cyclopās, herōs, herōidēs, Hectorās, &c.  
2. Et piētēs anūs enovats pēnis. Petron.  
4. Nībēs his vēnōm, quam nōquēm arcerē tōfēt — Ovid.  

16. Words ending in ES lengthen that syllable; as rés, spēs, vulpēs, quīēs, herēs, eōsēs, Anchēsēs, totēs, loculpes.  
Velsē ad canān dictūr ciconiān. Phādrē  

1. 'The nouns and vocatives plural of Greek nouns increasing (not in es) short in the singular, are short; as Amazonēs, Arcēades, Delphēnēs, Nālādēs, Gryphēs, Phrygēs.  
2. To which may be added Greek vocatives singular in es, coming from nominatives in es, not formed from es of the Doric dialect, and having their genitive in es; as Demotēthēs, Socrates.
QUANTITY.

3. * Et, in the present tense of *cum, and its compounds, is short; as ades, abes, prodes, potes, &c.; and in the preposition penes.

4. Latin nouns of the third declension, in *et, increasing short in the genitive, are short in the final syllable; as hebès, alès, pedès, limès, obsés. But *et is long in the following; Cerès, paries, aries, abès, piès, and its compounds, as bipès, tripes, alipes, fiones; to which some add praepeto, a derivative of praepeto.

1. Treadès; et patrie fumantia tecta reliquent. Ovid.
2. Quisquis ex eo, millo hinc juxta obliviscere Græcis. Virg.
4. Vixi quos ex rapto, non heptis ab hostis tutus. Virg.
5. Flava Cerès ad neci quumque spectat Olympos. Virg.

*Note.—1. Though *et, in the present tense of *cum and its compounds is short, it is not in any other tense, nor in the final syllable of *cum, (as has been asserted), as

Poenès in tanto vite fia figiato? Propret.
Eftus loni fincta puella maris. Propret.

2. Whenever paries, aries, and abies are found long, there happens to be a cætura; and perhaps Cerès and pes are long by dialeque: Antonius shortens bipes and triges; and Probus observes that alipes and fonipes are likewise short; though the contrary appears in Virgil, Lucan, and Horace, yet some of the above-mentioned words could not be introduced into horæaque without the influence of a figure to lengthen their final syllable. Prapes, which comes not from pes, but from *peregrinis, is short in Virgil. (E. N. 5. 254.) Tiges, ascribed to Ovid, is, by the bell critics, rejected.

17. IS final is short; as bis, is, quis, cis, magis, turris, militis, creditis, Thetis.

Tum cés ad occasum, bis fe convertit at orum. Ovid.

1. Except *plural cafes in is; as nobis, vobis, (’quis for quibus), musis; the plural accusatives omnis, 4 urbis, &c.

2. The nominative in *is is long, when the genitive ends in *itis, *inis, or *entis long; as is, Samius, Salamis, Simois.

3. Is is long in the adverbs gratias and foris; in the noun gnis, and in vis, whether noun or verb.

4. All *second person singulars in *is are long; when the second persons plural have *ius long; as cis, fis, vis, is, *abuis, audis, velis, nolis, poësis, &c.

5. *Ri of the perfect is commonly considered short, of the "future", common; so are the penultimates of ausis and faxis; ris and ritis of *ero and potero are more frequently short.

1. Inducendus est et: das *uëst title munus. Martr.
2. Quid ante ora *patrum Trojæ fab minibus altis. Virg.
5. Sed is est nisi de tribus capellis. Virg.
7. Linea convexi viae et fine pondere cali. Hor.
9. Gratias anhelans, multa agendo, nil agens. Hor.
11. *Ego gentes ilium, aut quasi non aviro urbes. Hor.
14. OS final is long; as rōs, vōs, nōs, mōs, trōs, trōs, arbō, honōs, cufōs, nepōs.

6. Except *Greek genitives in *ar; as Arcades, Tethyinos, Terebos, Orphes.

2. Alto comos, impos, and *os-offis, with its compounds exós, have the final syllable short.

3. *Greek nominatives and vocatives of the second declension have or short; as Claros, Tenedos, Lebös, Atropos. But those nouns of the Attic dialect, having their genitives in *os, are long, as Androgeos, Athos: also nouns of the same dialect, which have changed *eros (λήθα) into lor (λήθα), as Penelos, Menelaos.

4. Greek neuters in *ar are short; as Argos, epós, cæs, melos.

2. Inesperet, & veni potius consueput eris. Ovid.
4. Tum cum tritis erat, deferit est Ilis ordin. Ovid.
5. Quantus Athen, aut quæ quœs, aut ipse caruus. Virg.


Incepit: pacefacentes servavit Tityros hædus. Virg.

1. Except *monosyllables in *us; as grus, plus, rüs, thun, jus.

2. Also the *genitives of feminine nouns in *a; as Clitis, Sapphus, Mantis.

3. Genitives singular, and nominatives, accusatives, and vocatives plural of the fourth declension, (all being contracted), have or long; as fractus, manus.

4. Also nouns increasing long in the genitive; as palus-ūdis, virtus-ūris, tellus-ūris, Opis-āntis.

5. Us is long in the contr. compounds of *saeus (forming the genitive in podis or podos,) as Tripüs, Melampüs, Odpipüs, Polyopus.

6. Also *those nouns which have *u in their vocative; as Panthüs, O Panthu.

7. Finally, *lae vocis has the final syllable long.

1. Romeis vīs opts, abuentem nutritum urbem. Hor.

20. YS final is short; as Capys, chelys, chamys.

At Capys, et quoniam melior fementia ment. Virg.

21. nominal and vocatives in *ya also; as Gortys, Phorcys. To these add contracted plurals; as Erynys, for Eryneys, or Erinys.

21. Final T shortens the preceding vowel; as caput, amät.

Venam hoc tantum alias inter: capit caudiur urb. Virg.

Except when final *t is long by craftis; as redit for reddi or reditiv.

Magus eliv est et corniculatus Othoni. Juven.

1. The last syllable of every verse is considered common; that is, if the syllable be naturally long, it may be accounted short; or, if it fuit the verse, voce verbis.

Gemināmica mīhi Tyrrenum navigat aquātur. Hor.

Cretic occulto ut illum aerē. Hor.

*Note.—1. In the first of the examples, *ar, naturally short, forms the second syllable of a spondee; in the last, a Suppuric verce, the word aerē, which is naturally a spondee, forms a trochee.

2. *The conscripts that diploede Dr. Clarke, (see Clarke’s Homer, Iliad A. v. 54,) by saying that the last syllable of a verse is common, only meant, that the local quantity of the syllable—'

For the last principal head of prosody; see Versification.

QUAN-TSOM, in Geography, a town of China, of the third rank, in Pe-chel-li; 32 miles S. of Chunte.
QUANTUM Meruit, called also an auff umpfs, in Law, an action upon the cafe, grounded upon a neceffity to pay a man for doing any thing so much as it deferves or merits.

This valuation of his trouble is submitted to the determination of a jury; who will affefs such a sum in damages as they think he really merited.

Qua tum Velebat, or an implied affumpft, is where goods and wares sold, are delivered by a traderman at no certain price, or to be paid for them as much as they are worth in general; then quantum velebat, or an action on the cafe, lies, and the plaintiff is to aver them to be worth so much; so where the law obliges one to furnish another with goods or provisions, as an inn-keeper his guests, &c.

Quanzt, John Joachim, in Biography, chamber musician to Frederic II, king of Prufia, to whom he had been flute-mifer before his acceffion to the crown. Quanzt was born at Oberfcheden, a village in the electorate of Hanover, in 1697. His father, who was a blacksmith, obliged him to work at the anvils before he was nine years old; which might have afforded him an early opportunity of making the famous Pythagorean experiment, mentioned by Jamblimus (de Vit. Pythag.), and by all the musical writers of antiquity. Indeed, the ear of our young Arbalus had been already formed, in his excursions with his brother, a village musician, who used to play about the country on holydays and festivals, whom he accompanied upon these occasions, on the base-viol, when but eight years old, and without knowing a note of music; but this performance, bad as it was, pleased him so much, that he determined to choose music for his profession; though his father, who died when he was only ten years of age, recommended to him, on his death-bed, to continue in the honourable profession of his ancestors.

Quanzt, after losing his father, had no other friends to depend upon for countenance and protection, than two uncles, who lived at Merfeb and Saxony; and these, sending for him, gave him the choice of their several professions, the one being a tailor, and the other a kunstpfiffer, or town-wait.

Upon this occasion, the passion for music in the young Quanzt overpowered all other considerations, and, preferring the fiddle-flight to the anvils or hearth, he bound himself apprentice to his uncle, the musician, for five years; but this uncle dying three months after, he was transferred to his son-in-law, Fleifchback, who was of the same profession; and it was under him that he first practifed the violin, an instrument to which his inclination at this time impelled him, preferably to any other.

Soon after this, however, he practifed the hautbois, and the trumpet, with which instruments, and the violin, he chiefly filled up the term of his apprenticeship; but as a true town musician, in Germany, is expected to play upon all kinds of instruments, he had been obliged, occasionally, to apply himself, during this period, to the fackon, cornet, base-viol, French horn, common flute, balifon, viol da gamba, and the lord knows how many more. These were in the way of business, but for pleasure, he now and then took lemons on the harpsichord, of the organif Kiewetter, who was likewise his relation; by which he laid the findentation of his knowledge in harmony, and love for composition.

Luckily for Quanzt, his master, Fleifchback, was not, like other country musicians, fond only of old, dry, stiff, and taffoif compositions, but had sufficient dexterity to choose his pieces out of the newest and beet productions of the times, by Telemann, Melchoir, Hofmann, and Heinechen, which were published at Leipfic; from the perusal, and practice of which, our young performer derived great advantage.

The duke of Merfeb’s band not being very numerous, the town-waits, at this time, were often called in, to affift at the musical performances, both of court and chapel. Here Quanzt frequently heard foreigners play and sing, in a manner far superior to any professors whom he had hitherto met with, which excited in him a strong defire to travel. Drefden and Berlin were at this time the most renowned cities in Germany, for the cultivation of music, and the number of able musicians. He eagerly wished to visit one of those cities, but was deficient of the means. However, he now began to feel his strength, and trusting to his feet and his fiddle, he boldly set off for Drefden.

It was in the year 1714 that he arrived in that city. His firft entrance was not auspicious, being wholly unable to procure employment: on this account, he made an excursion to Radeburg, where a journeyman fiddler being wanted, he entered into the service of the town musician, Knoll; but alas! he was soon driven from this poft, by the fatal accident of the town being burnt down by lightning. Again reduced to the state of a fugitive, and a wanderer, he levied contributions round the country by the power of his violin, which was now his principal instrument, till he reached Pirna.

Here, defigned still to be fervos fervorum, he could procure no other means of exercifing his profession, than by accepting the office of deputy to a fick journeyman musician of the town. It was during this time, that he firft saw Vivaldi’s concertos for the violin, which were fo congenial to his own feelings and ideas of perfection, that he made them his model as long as he continued to pracifie that instrument.

Still regarding Drefden as his centre, he eagerly accepted an offer that was made to him, of being temporary affiftant, to one of the town-waits, who was then ill; an employment which he preferred, for the opportunities it afforded him of hearing good music and good musicians, to the more honourable poft of being the bell of bad musicians at Berenburg, where he might have been appointed first violin, with a good salary.

His second arrival at Drefden was in the year 1716, where he soon discovered that it was not fufficient for a musician to be able to execute the mere notes which a composer had set on paper; and it was now that he firft began to be fensible of the exifence of fyle and expression.

Aurifius II. was at this time king of Poland, and elector of Saxony, and the orchestra of this prince at Drefden was in a flourishing condition; however, the fyle which had been introduced there, by the concert-mater Volmer, was French; but Pfendel, who succeeded him, introduced a mixed fyle, partly French, and partly Italian, which he afterwards brought to fuch perfection, that Quanzt declares, he never heard a better band in all his future travels.

No orchestra in Europe could now boast of fo many able profeflors, as that of the elector of Saxony, among whom, were Pfendel and Veracini, on the violin; Pantaleone Benvenite, on the pantalone; Weifs, on the lute; Richter, on the hautbois; and Buffardin, on the German flute; not to mention several excellent performers on the violoncello, balifon, French horn, and double-bafe.

Upon hearing these great performers, Quanzt was filled with fuch wonder, and posfessed of fuch a rage for improvement, that he laboured incessantly to render himself worthy of a place among fuch honourable associates.

For, however prejudiced he may have been in favour of his own reputable calling of kunstpfiffer, he began now just to think it fufficient for him to be prevailed upon, to relinquish that part of it, at leaft, which required him to play
country dances, though in itself so jovial, pleafant, and fatal an employment.

He continued, however, to be the kunftpfeifer's delegate in this city, till the death of Auguflus II.'s mother, in 1717, at which time, the general mourning procribing the use of every species of convivial mufic, he again, in his ufual manner, commenced traveller, and fiddled his way through Silefia, Moravia, and Austria, to Vienna; and in the month of October, of the fame year, returned through Prague to Drefden; which journey, he thinks, contributed more to his knowledge, in practical geography, than in any other art.

The jubilee of the reformation, brought about by Dr. Luther, happening to be celebrated soon after his return, he was called upon, among others, to perform a part upon the trumpet, at church, where the chapel-mafter Schmidt having heard him, offered to prevail on the king to have him regularly taught that instrument, in order to qualify him for the place of court trumpeter; but Quantz, however ardently he might have wished for an office at court, declined the acceptance of this, well knowing that the good taste to which he aspired, was not to be learned upon that instrument, at leaft as it was then played in Drefden.

In 1718, the Polish or royal chapel was intituted; it was to confift of twelve performers, eleven were already chosen, and a hautbois player, only, was now wanting, to complete the number. After undergoing the several trials, and giving the requisite proofs of his abilities, he had the happiness to be invested with that employment, by the director, baron Seyfertitz, with a salary of 150 dollars, and a lodging.

This was an important period in his life, and in the exercise of his profefion. The violin, which had hitherto been his principal instrument, was now laid aside for the hautbois, upon which, however, he was prevented from distinguing himfelf, by the feniiority of his brethren. Mortified at this circumstance, he applied himself feroiusly to the German flute, upon which he had formerly made some progresfes without a matter; but his motive now for refuming it, was the certainty of his having no rival, in the king's band, as M. Friepe, the firit flute, had no great paffion for mufic, and readily relinquifhed to him his place.

In order to work upon fure ground, Quantz took lessons at this time of the famous Buffardin, with whom, however, he only played quick movements, in which this celebrated flute-playerchiefly excelled. The fecracy of pieces, composed expressly for the German flute, was fuch, at this period, that the performers upon that instrument were obliged to adopt thofe of the hautbois, or violin, and by altering or tranfpoiting, accommodate them to their purpofe, as well as they could.

This stimulated Quantz to compose for himfelf; he had not as yet ever received any regular instructions in counterpoint, to that, after he had committed his thoughts to paper, he was obliged to have recourse to others to correct them. Schmidt, the chapel-mafter, had promised to teach him composition, but delayed keeping his word from time to time, and Quantz was afraid of applying to Heinichen, his colleague, for fear of offending Schmidt, as thofe matters were upon bad terms together. In the mean time, for want of other affifiance, he diligently studied the fores of great mifters, and without stealing from them, endeavoured to imitate their manner of putting parts together, in trios, and concertos.

About this time he had the good fortune to commence a friendhip with Pifendel, now appointed concert-mafter, in the room of Volumier. Quantz is very warm in his praise of Pifendel, whom he calls a profound theorifit, a great performer, and a truly honeft man. It was from this worthy concert-mafter that he learned to perform an adagio, and to compose in many parts. Pifendel had in his youth been taught to fing by the famous Pilucchi, and had received instructions, on the violin, from Torelli; however, having travelled through France and Italy, where he had acquired the peculiarities in the taste of both countries, he fo blended them together as to form a third genus, or mixed fyle of writing and playing, which was half French and half Italian. Influenced by his example, Quantz declares, that he always preferred this compound fyle, to that of Italy, France, or the national fyle of his own country.

At the marriage of the prince royal of Poland, in 1719, several Italian operas were performed at Drefden. Lotti, the famous Venetian mafter di capella, together with the moft celebrated fingers of Italy, male and female, were called thither upon this occafion; these were the firt Italian operas which Quantz had heard, and he confefles, that the performance of them gave him a very favourable idea of the genuine and fonnd Italian mufic, from which he thinks later times have too much deviated.

After describing the talents of the fingers who will have their place in our alphabet, he informs us that this famous opera at Drefden, was broken up by a quarrel between Heinichen, the king of Poland's chapel-mafter, and Senefino, who this fame year, 1719, went to England for the firt time.

Nothing very interesting occurs in the life of Quantz from this period, till 1723, when he took a journey with Weifs, the famous luteflit, and Graun, the compofitor, to Prague. Quantz, not long after the coronation of Charles VI. at Prague, went to Italy in the fuite of count Lagnasco, with the confent of his royal mafter, the king of Poland. He left Drefden in May 1724, and, when he arrived at Rome, he found that Vivoldi had fince introduced the Lombard fyle in that city, with which the citizens were fo captivated, that they would hear no other.

During his residence at Rome, he took lefions in compofition of the famous Gaffarini, who was at that time seventy-two years of age; and after studying counterpoint with him, which he calls mufic for the eye, he went to work for the ear, and composed foles, duets, trios, and concertos; however, he confefles, that counterpoint had its ufe in writing pieces of many parts; though he was obliged to unlearn many things, in practice, which theory had taught him, in order to avoid that dry, and stiff fyle, which too clofe an adherence to rules is apt to produce; upon this occafion, he very judiciously observes, that invention is the firit requisite in a compofitor, and that it behoves him to prefe a friendhip between harmony and melody.

In 1725 he went to Naples, where he met with his countryman Haffe, who then studied under Alex. Scarlatti. Haffe had not, as yet, diftinguifhed himfelf by any compofitions for the stage; however, it was at this time, that a confiderable Neapolitan banker employed him to fet a ferenata for two voices, which he did in the prefence of Quantz; the fingers who performed it, were Farinelli and Tafi. Haffe gained fo much reputation by this production, that it paved the way to his future fuccefs, and he was foon after appointed compofitor of the great opera at the theatre royal.

Quantz intreated Haffe to introduce him to his mafter, Scarlatti, to which he readily consented; but upon mentioning him to the old compofitor, he faid, "my fon, you know I hate wind instruments, they are never in tune." However, Haffe did not ceafe importuning him, till he had obtained the permission he required.

In
In the visit which he made to Scarlatti, M. Quantz says, that he had an opportunity of hearing him play on the harpsichord, which he did in a very learned manner; but observes, that his abilities on that instrument were not equal to those of his son.

Before his departure from Naples, M. Quantz frequently heard concerts at the duke of Lichtenstein's, in which Haffi, Farinelli, Tafi, and Francichello, were employed.

In 1726 he was at Venice, during the performance of two rival operas, "Siface," composed by Porpora, and "Siroe," by Vinci; the latter was most applauded. The Cav. Niculini, a contralto, La Romanina, a deep sopran, and the famous tenor, Paita, were the principal fingers in these dramas.

San Martini, the celebrated performer on the hautbois, who afterwards established himself in London, was now at Venice, as was Vivalli.

At Turin he met with Somis, under whom, Le Claire was at that time a scholar on the violin.

From Turin he went to Paris, which, with respect to music, was going from one extreme to another.

His character of French singing in the former part of the last century, is very just and characteristic.

"I was delighted with the French taste now," says M. Quantz, "though I had heard it formerly with patience. The old, worn-out, second-hand thoughts, and passages ill-expressed, disgusted me now, as much as a stale dish warmed again. The resemblance between recitative and air, with the affected and unnatural bowing of the fingers, particularly the women, shocked my ears."

M. Quantz was the first who applied an additional key to the German flute, in order to correct its imperfections; and it was in the course of this year, 1726, that he made the discovery.

In 1727 he arrived in London, where he found the opera in a very flourishing state, under the direction of Handel. The drama of "Admetus" was now in run, of which, he says, the music was grand and pompous. Senefino performed the first male part, and Cuzzoni and Faustina were the principal women.

He then gives a character of the fingers, flute of the opera, and of music in general in London, very correctly.

Upon his return to Dresden, he was established in the king's chapel, with an addition to his former salary of 250 dollars a-year. He now entirely quitted the hautbois, supposing it hurtful to the embouchure of the flute, which, from this time, he made his sole study.

In 1728 he went to Berlin, with baron Seyfertiz, in the suite of the king of Poland; where he was obliged, at the command of the queen of Prussia, but with the permission of his royal master, to remain for some months. Pifendel, Weits, and Buffardin, were, by the same order, called thither. After he had had the honour of playing before the queen two or three times, he was offered a place and pension of 800 dollars a-year. He was very willing to accept of them, but the king his master would not grant his consent: however, this prince gave him a general permission to go to Berlin as often as he was desired.

This year, 1728, the prince royal of Prussia determined to learn the German flute, and M. Quantz had the honour to teach him. On this account, he was obliged to go twice a year to Berlin, Ruppin, or Reinsberg, the several residences of his royal scholar.

After the death of the king of Poland, in 1732, his son, Augustus III. not choosing to dismiss M. Quantz, raised his appointment to 800 dollars, and confirmed the permission which had been granted by his royal father, for his going occasionally to Berlin.

In 1734 he published his first folio; but he does not acknowledge the sonatas, which were printed under his name, in Holland, about that time.

In 1739, M. Quantz finding a great scarcity of German flutes, undertook to bore them himself for the use of his pupils; an enterprise which, afterwards, he found to be very lucrative.

In 1741 he was again invited to Berlin, in order to enter into the service of his royal scholar, then king of Prussia, with offers of an annual pension of 2000 dollars for life; a separate payment for compositions; 100 ducats for every flute he should deliver; and an exemption from playing in the orchestra, or any where else, but in the king's chamber, as well as from dependence on any other commands than those of his majesty; which terms, as the king of Poland was too gracious longer to refuse his dismission, M. Quantz was unable to resist.

In 1752 he published his "Art of Playing the German Flute!" and it was this year that he invented the new joint for the upper-piece of the flute, by which means, without drawing out the middle piece, and without hurting the tone, the instrument may be raised or lowered half a note.

And now, having traced our industrus musician through the troublesome mazes by which he arrived at the temple of fortune, we had hopes that we should have left him to the enjoyment of that reputable cafe, that satisum cum dignitate, to which every artist in years aspires; but alas! this eminent musician and worthy man died at Potsdam in less than a year after we had seen, heard, and conversed with him in that summner reidence of his royal disciple and patron! A complete list of his works is given in Gerber.

QUANUSE, in Geography, a town of America, in the Tennessee government. N. lat. 35° 12'. W. long. 84° 28'.

QUAPA, a town of Louisiana, at the confluence of the Akanfis and the Mississippi. N. lat. 33° 48'. W. long. 91° 23'.

QUAPACTOTOTUL, in Ornithology, a name under which Niemering has described a bird, which, he says, imitates the human laugh. He says its body is eight inches long, and the tail as many; the beak of a blue-black, and bent and crooked; the breast grey, and the belly black; the tail of a brownish-black; and the wings, neck, and head, of a yellowish-brown.

This is the Cuculus ridibundus of Gmelin, the Cuculus Mexicanus of Buffon, and the Laughing cuckoo of Latham. It is found in New Spain.

QUAPIZOTUL, in Zoology, the name given by Hernandez to the Tajaçu of Maregrave, the Pecari of Buffon, and the Mexican hog of Pennant. See Sus Tajaçu.

QUAPOYA, in Botany, Abl. Guian. v. 2. 897. t. 343, 344, 345. a barbarous Caribbe name. See XANTHE.

QUAR in Agriculture, a term occasionally employed, in a provincial manner, to signify a small fort of quarry of any kind, but more especially of the lime-stone, free-stone, flag-stone, or slate-stone nature. It is much used in some of the more northern districts of the country. See QUARRY.

QUARANTAIN, in old Law Books, written Quarentaine, and Quarentenas, denotes the space of forty days.


"Quarentena in London, ponitur pro rectu habendi, 40 dies post funerem munimenon per breve regis, ut confuant, sc. &c. fit fibi viderint expedire." MS. de Temp. Ed. Ill.
The term is borrowed from the French quarantain; and is sometimes used for the time of Lent.

**Quarantain of the King**, in France, denotes a truce of forty days appointed by St. Louis, during which time it was expressly forbidden to take any revenge of the relations or friends of people who had fought, wounded, or affronted each other in words.

**Quarantain, or Quarantine**, is more particularly used for the term of forty days, which vessels, coming from places suspected of contagion, are obliged to wait in certain places appointed to air themselves before they come into port.

By the Stat. 26 Geo. II. cap. 6. explained and amended by 29 Geo. II. cap. 8. the method of performing quarantine, or forty days probation, by ships coming from foreign countries, is put in a much more regular and effectual order than formerly; and matters of ships coming from infected places, and disobeying the directions there given, or having the plague on board, and concealing it, are guilty of felony without benefit of clergy. The same penalty also attends persons escaping from the lazarettos, and officers and watermen neglecting their duty, and perpetrators conveying goods or letters from ships performing quarantine. *See Plague.*

In cafes of insurance, before the risk on a ship can be said to be completely ended, the mast not only has been 24 hours moored at anchor in her port of destination, but the mast has been during that time in good safety, in the fullest sense of those words. If, therefore, the ship is obliged to perform quarantine, this does not end the voyage. The voyage only ends when the ship is arrived at her port of destination, and is there moored 24 hours in good safety. Accordingly, if the ship, before the 24 hours are expired, be ordered to the proper place for performing quarantine, the risk continues, though she do not leave her moorings till long after the 24 hours are expired. See Risk.

**Quarantain also** denotes certain duties imposed upon ships, for the purposes of quarantine.

**Quarantine, Quarantine, or Quarantine, Quarantina, in Law**, denotes a benefit allowed by the laws of England to the widow of a man dying feised of land; by which the claimant may challenge to continue in his capital redemption, or chief manufactory (so it be not a cattle), for the space of 40 days after his decease; during which time her dower shall be affirmed. The particular lands to be held in dower must be aligned by the heir of the husband, or his guardian. *Co. Lit. 34, 35.*

If the heir, or any other person, attempt to eject her, she may have the writ of *quarantina habenda*; which lies for a widow to enjoy her quarantine.

**Quarantain also** is used for a measure or extent of land, containing 40 perches.

**Quarantaria, in Geography,** a high mountain between Jerusalem and Jericho; which, as tradition says, is the mountain to which our blessed Saviour was taken by the devil, when he tempted him with the visionary scene of all the kingdoms and glories of the world. This is, as St. Matthew styles it, an exceeding high mountain, and not only difficult, but dangerous, of ascent. It has a small chapel at the top, and another about halfway of its ascent, founded upon a prominent part of the rock. Near this latter are several caves and holes in the side of the mountain, made of anciently by hermits, and by some in later times, for places in which they kept their Lent; in imitation of that of our blessed Saviour. In most of these grots Maudrell found several Arabs quartered with fire-arms, who obstructed his ascent, demanding 200 dollars for leave to go up the mountain. He and his companions, says the traveller, departed without further trouble, not a little glad to have so good an excuse for not climbing so dangerous a precipice. Maudrell's Journey, &c. p. 80.

**Quarantia, in the Venetian Polity**, a court of judicature composed of forty judges.

The Venetians have an old civil quarantia, a new civil quarantia, and a criminal quarantia.

The criminal quarantia takes cognizance of all crimes except those against the state, which belongs to the council of ten. The new civil quarantia judges of appeals made from sentences made by judges out of the city; the old civil quarantia takes cognizance of appeals from sentences of feudal judges in that city.

**Quararibia, in Botany. See Myroda.**

**Quare clausum frigis, in Law. See Clausum frigis.**

**Quare ejusdem terminum,** a writ which lieth, by the ancient law, where the wrongdoer or ejector is not himself in possession of the lands, but another who claims under him. As where a man leaseeth lands to another for years, and, after, the lessor or reverfeioner entereth, and maketh a feufoin in fee, or for life, of the same lands to a stranger; now the lessor cannot bring a writ of *ejectione firme*, or ejectment, against the feufoin; because he did not eject him, but the reverfeioner: neither can he have any such action to recover his term against the reverfeioner, who did oul him; because he is not now in possession. And upon that account this writ was devised, upon the equity of the statute W. 2. c. 24. as in a case where no adequate remedy was already provided. And the action is brought against the feufoin for forcing, or keeping out, the original lessor during the continuance of his term; and herein, as in the ejectment, the plaintiff shall recover so much of the term as remains; and also shall have actual damages for that portion of it, whereof he has been unjustly deprived. But since the introduction of fictitious oulters, whereby the title may be tried against any tenant in possession, (by what meansforever he acquired it,) and the subsequent recovery of damages by action of trespass for mine profits, this action is fallen into disuse. See Ejectione Firme.

**Quare impeditis, a writ which lies for him who has purchased an advowson, against him who disturbs him in the right of it, by presenting a clerk to it when the church is void.**

It differs from the ailege of darrein presentment, ultima presentationis, which lies where a man, or his ancestors, formerly presented; this other lying for him who is the pur-chafer himself. Where a man may have the ailege, he may have this writ, but not contrariwise.

In contested presentations, upon the first delay or refusal of the bishop to admit his clerk, the patron usually brings his writ of quare impeditis against the bishop, for the temporal injury done to his property, in disturbing him in his presentation. And if the delay arises from the bishop alone, as upon pretence of incapacity, or the like, then he is only named in the writ; but if there be another pretention set up, then the pretended patron and his clerk are also joined in the action; or it may be brought against the patron and clerk, leaving out the bishop; or against the patron only. But it is most advisable to bring it against all three: for if the bishop be left out, and the suit be not determined till the six months are past, the bishop is entitled to present by lapse; for he is not party to the suit: but, if he be named, no lapse can possibly accrue till the right is determined. If the patron be left out, and the writ be brought only against the bishop and the clerk, the suit is of no effect, and the writ shall abate; for the right of the patron is the principal question in the cause. If the clerk be left out, and has re-
ceived institution before the action brought, (as is sometimes the case,) the patron by this suit may recover his right of patronage, but not the present turn; for he cannot have judgment to remove the clerk, unless he be made a defendant, and party to the suit, to hear what he can allege against it. For which reason it is the fader way to inflict all three in the writ.

The writ of quare impedit commands the disturbers, the bishop, the pseudo-patron, and his clerk, to permit the plaintiff to present a proper person (without specifying the particular clerk) to such a vacant church, which pertains to his patronage; and which the defendant, as he alleges, do obstruct; and unless they do so, then that they appear in court to shew the reason why they hinder him.

Immediately on the filing out of the quare impedit, if the plaintiff suspects that the bishop will admit the defendant's or any other clerk, pending the suit, he may have a prohibitory writ, called a ne admissitas; which recites the contention begun in the king's courts, and forbids the bishop to admit any clerk whatsoever till such contention be determined. And if the bishop doth, after the receipt of this writ, admit any person, even though the patron's right may have been found in a jure patronatus, then the plaintiff, after he has obtained judgment in the quare impedit, may remove the incumbent, if the clerk of a stranger, by writ of seire facias: and shall have a special action against the bishop, called a quare incumbavit; to recover the presentation, and also satisfaction in damages for the injury done him by inumbering the church with a clerk, pending the suit, and after the ne admissitas received. But if the bishop has inumbered the church by inluting the clerk, before the ne admissitas issued, no quare incumbavit lies; for the bishop hath no legal notice, till the writ of ne admissitas is served upon him. The patron is, therefore, left to his quare impedit merely; which now lies (since the statute of Welfm. 2.) as well upon a recent usurpation within six months past, as upon a disturbance without any usurpation had.

In the proceedings upon a quare impedit, the plaintiff must set out his title at length, and prove at least one presentation in himself, his ancestors, or those under whom he claims; for he must recover by the strength of his own right, and not by the weaknesses of the defendant's; and he must also shew a disturbance before the action brought. Upon this the bishop and the clerk usually disclaim all title: save only, the one as ordinary, to admit and inliture; and the other as presentee of the patron, who is left to defend his own right. And, upon failure of the plaintiff in making out his own title, the defendant is put upon the proof of his, in order to obtain judgment for himself, if needful. But if the right be found for the plaintiff, on the trial, three farther points are also to be inquired: 1. If the church be full; and, if full, then of what presentation; for if it be of the defendant's presentation, then the clerk is removable by writ brought in due time. 2. Of what value the living is: and this in order to affect the damages which are directed to be given by the statute of Welfm. 2. 3. In case of plenary upon an usurpation, whether six calendar months have passed between the avoidance and the time of bringing the action: for then it would not be within the statute, which permits an usurpation to be divested by a quare impedit brought infra tempus semelius. So that plenary is still a sufficient bar in an action of quare impedit, brought above six months after the vacancy happens; as it was universally by the common law, however early the action was commenced.

If it be found that the plaintiff hath the right, and hath commenced his action in due time, then he shall have judgment to recover the presentation; and, if the church be full by inlitation of any clerk, to remove him: unless it were filled pendente lite by lapse to the ordinary, he not being party to the suit; in which case the plaintiff loses his presentation pro hac vice, but shall recover two years' full value of the church from the defendant, the pretended patron, as satisfaction for the turn left by his disturbance: or, in case of incompetence, the defendant shall be imprisoned for two years. But if the church remains full void at the end of the suit, then whenever party the presentation is found to belong to, whether plaintiff or defendant, shall have a writ directed to the bishop ad admittendum clericum, reciting the judgment of the court, and ordering him to admit and institute the clerk of the prevailing party; and, if upon this order he doth not admit him, the patron may sue the bishop in a writ of quare non admittis, and recover ample satisfaction in damages.

Besides these possessory actions, there may be also had a writ of right of advowson, which resembles other writs of right: the only distinguishing advantage now attending it, being, that it is more conclusive than a quare impedit; since to an action of quare impedit a recovery had in a writ of right may be pleaded in bar.

There is no limitation with regard to the time within which any actions touching advowsons are to be brought; at least none later than the times of Richard I. and Henry III. for by statute 1 Mar. fl. c. 5. the statute of limitations, 32 Hen. VIII. c. 2. is declared not to extend to any writ of right of advowson, quare impedit, or ashe of darren prezentment, or jus patronatus.

In a writ of quare impedit, which is almost the only real action that remains in common use, and also in the ashe of darren prezentment, and writ of right, the patron only, and not the clerk, is allowed to sue the disturber. But, by virtue of several acts of parliament, there is one species of presentations, in which a remedy, to be sued in the temporal courts, is put into the hands of the clerks prented, as well as of the owners of the advowson. We mean the presentation to such benefices, as belong to Roman Catholic patrons; which, according to their several counties, are vested in and secured to the two universities of this kingdom. And particularly by the statute of 12 Ann. fl. 2. c. 14. § 4. a new method of proceeding is provided; viz. that, besides the writs of quare impedit, which the universities as patrons are entitled to bring, they, or their clerks, may be at liberty to file a bill in equity against any person prenting to such livings, and disturbing their right of patronage, or his ejusque vestris, or any other person whom they have cause to dilpet; in order to compel a discovery of any secret trusts, for the benefit of Papists, in evaion of those laws whereby this right of advowson is vested in those learned bodies: and also (by the statute 11 Geo. II. c. 17.) to compel a discovery whether any grant or conveyance, said to be made of such advowson, were made bona fide to a Proletant purchaser, for the benefit of Proletants, and for a full consideration; without which requisites, every such grant and conveyance of any advowson or avoidance is absolutely null and void. Blackst. Com. b. iii.

Quare incumbavit, a writ which lies against the bishop, who, within six months after the vacancy of a benefice, com- fers it on the clerk of any one, while two persons are con- tending at law for the right of prezentment. This writ lies always depending the plea. See the preceding article, Presentation, Assise of darren prezentment, &c.
QUA

Quare non admitit, a writ which lies against the bishop, for refusing to admit his clerk, who has recovered in a plea of advowson, on pretence of lapse, &c. See Quare impleads.

Quare non permitis, a writ that lies for one who has a right to present for a turn against the proprietary.

Quare obfruxi, a writ that lies for him, who, having right to paes through his neighbour's grounds, cannot enjoy the same, because the owner has fenced it up.

Quarentina. See Quarantain.

Quarera, or Quaratia. See Quary.

Quaritz, in Geogrophy, a town of Silelia, in the principality of Glogau; 5 miles W. of Gros-Glogau.

Quarken, or Quaren, a cluster of small islands, in the gulf of Bothnia, near the east coast. N. lat. 65°10'. E. long. 21°.

Quarles, Francis, in Biography, an English poet, born in 1592, near Rumford, in Essex, was son of James Quarles, esq. who held an office at the navy board in the reign of queen Elizabeth. The subject of this article was educated at Chrift's-college in Cambridge, and was afterwards entered a student in Lincoln's Inn. He obtained the place of cup-bearer to the queen of Bohemia, daughter to James I: and upon his return, he was appointed secretary to archbishop Usher in Ireland, from which country he made his escape, on the breaking out of the rebellion in 1641, after the los of his property. He had before distinguished himself by some works, chiefly on religious subjects, in consideration of which he had a pension from Charles I. About this time he had the post of chronologer to the city of London. On the commencement of the civil wars, he gave great offence to the parliament by a work, entitled "The Loyal Convert;" and when he actually joined the king at Oxford, he was plundered of his estates, his books, and manuscripts. Thefe lofes he did not long survive. He died at the age of 52, in 1644. Of his numerous writings, as well in prose as in verfe, the most celebrated, and indeed by which he is almost entirely known, is his "Emblems," a fet of defigns exhibited in prints, and elucidated by some lines attached to each. A confiderable part of the work is borrowed from the "Emblems" of Hermannus Hugo, but his verfes are his own. For a confiderable time they excited a large portion of public admiration in the religious world. They then fell into contempt; but we believe a new edition has of late years been given to the world. Quarles is thus characterized by an able critic: "He is by no means without his beauties; and his verfes, which are generally smooth, afford occasional bufts of fancy, and strokes of pathos, which are in real genius, though overrun with falses tastes. Mr. Jackfon of Exeter, in his "Letters on various Subjects," endeavoured to recall the public attention to this neglected poet, and pointed out with much feeling some of his brilliant passages; but though curiounfs may be amufed by hunting for his scattered beauties, he can never regain a place among the English classical poets."

Quarlesville, in Geography, a poft-town of America, in Brunswick county, Virginia; 204 miles from Washington.

Quarname, a town of Sweden, in the province of Smaland; 23 miles S. of Wexio.

Quarnero, or Cornnero, Gulf of, a part of the Adriatic, between Istria and Marlocha, anciently called "Sinus Platinicus." It is subject to sudden storms and hurricanes, which render its navigation dangerous.

Quarre, Fr. In old French muse, B quarre was the term for B. See Quadro.

Quarré les Tombes, in Geography, a town of France, in the department of the Yonne, and chief place of a canton, in the district of Avalon; 6 miles S. of Avalon. The place contains 2007, and the canton 7287 inhabitants, on a territory of 1924 kilometres, and 9 communes. Quarrée, in the old French time-table, implied a breve, or square note, equal to two semi-breves. See Time-table.

Quarrel, Querela, in Law. See Querela.

Quarrel feems properly to relate to personal actions, or at mолt to mixed ones, wherein the plaintiff is called quarras; and in all declarations of trepas, it is said, quarras.

Yet if a man release all quarrels or querelles, (a man's own deed being taken mолt strongly against himself,) quarrel includes all actions; and accordingly all actions, both real and personal, are hereby released.

Quarrels or affairs in a church or church-yard are esteemed very heinous offences, as being indignities to him whose service these places are consecrated; therefore mere quarrellome words, which are neither an affair nor an offence in any other place, are penal here. See AFFRAY.

Quarrel between the French and Italian singers at Rome, in the time of Charlemagne; for which we refer to our article CHARLEMAGNE. See also Rossinaud's Dictionary.

Quarrel, in Armory, a bolt, or square-headed arrow, to shoot out of an arbalist, or cors-bow.

Quarrel of Glofs. See Quary.

The word is formed, by diminution, from the Latin quadratum, or the French quarre, square; or, perhaps, immediately from the Italian quadrato, little square.

Quarry, in Agriculture, the common name of an opening, pit, drift, or shaft, which is dug into the earth or ground, and from which are to be raised ores of various kinds, different sorts of flones, flates, and other materials of similar natures. It is remarked by the writer of the work on "Landed Property," that the more useful and advantageous materials and substanccs that have at different times been dug and raised out of quarries in this country, are chiefly those of the iron ore kind, lime-flone, and other calcareous matters, materials for building, such as flates, flags, flones, and substanccs of other sorts, matters for the con structing and repairing of roads, as sand, gravel, and others of the same nature, earthy substanccs for the purposes of different manufactures, such as clays, &c. moulds and vegetable earthy matters, and coals, with other articles for use as fuel. There are, however, occasionally raised from openings of this nature, a few other kinds of substanccs, such as will be noticed below.

It has been farther supposcd by the above writer, that the substanccs which he has here mentioned, may with truth be said to be of more real use and value to mankind than all the mines of precious metals in the world; and that the eyes of the managers of landed estates shouid constantly be turned towards and fixed upon the discovery of the hidden valuable treasures and productions of this nature, wherever there is a probability or likelihood of their being to be met with. It is also suggested, that it would be highly beneficent and advantageous if mineralogists, and those who are acquainted with such substanccs, were to turn their attention towards the appearances or accompaniments which point out such useful concealed matters; as it might greatly facilitate the search for them, and frequently lead fortuitously to their discovery. The methods which are practised in searching for and ascertaining the presence of different sorts of materials...
The common methods of working and managing different forts of quarries, are in general, in most places, tolerably well understood and regulated, by such quarrymen as are constantly employed in the business; but a circumstance which they commonly neglect very much, or are in a great degree inattentive to, in many cases, is that of making good the ground below, by means of the turf or soil which is cast off from the top, or upper parts; and that of keeping the mouths of the openings sufficiently clear and free. Another common difficulty incident to them, is that of draining, and cleaning their bottom parts from injurious water. This may be effectet in various ways, as by the use of different forts of machinery worked by wind, water, and steam, and by some other means. See Quarrles, Pits, &c. Draining of.

In many of the more southern districts of the kingdom, and still more in those towards the north, and in Wales, there are quarries, from which substances of some of the following kinds are raised and used in their neighbourhoods, or sent away to a distance, in a very extensive manner; such, for instance, as those of the flinty kind, as iron-flone or ore, lime-flone, marble, chalk, granite, free-flone, grit-flone, flag-flone, white, grey, purple, and blue flate-flone, sand-flone, sand, gravel, clay-flone, sflythe-flones, tile-flones, &c.; different ooches, plumbago or black lead, calamine, gypsum, marle, pipe-clay, alum-earth, fuller’s-earth, peat-earth, culm, coal, cannel, salt-rock, &c. These flones and pits are wrought, and the materials got up from them, in several different ways, according to circumstances and convenience, as well as the particular nature, kinds, qualities, &c. of the different articles themselves; all of which are mostly well known, and capable of being performed by the workmen of their respective neighbourhoods, who are commonly employed in them, and very expert in their management.

Stony substances which bear a great variety of different names, and which possess equal variety in their qualities and useful properties, are met with, and dug up from quarries and pits, in many different districts and situations, in almost all parts of this island, in order to be converted to purposes of improvement and utility in a variety of different ways and intentions. Iron-flones and ores abound more in the northern parts, though they are occasionally found in some of the southern ones. A considerable quantity of highly rich iron-flone is got up and sent annually from the vicinity of Combemartin in Devonshire, to the iron-works of Mr. Raby at Llennyrth in South Wales. A large portion of it is also found on the borders of the Orkney river, and dispersed throughout the whole district, as well as in other parts of the same county.

Iron-flone is likewise met with in Suffolk in large quantities, imbedded with lime-flone and sand-flone, which rises near to the surface being the bile, the other having a coarser and more dull appearance, working heavier in the furnace. The very belt is frequently interferred with thin strips of soft marly matter. Iron-flone, to a great extent, exits on the cliffs of lord Dudley, and many others in Staffordshire, and contributes much to the employment and prosperity of the inhabitants. But, in the northern part of Lancashire, in the district of Low Furnes, flone and ore of this fort are perhaps found in the largest quantity, of the belt kind, and in the most general manner, of any where in the kingdom. There are numbers of shafts, quarries, and pits for working them, from, on Lindal Moor, Whittrig Moor, and Crofs Gate, in the vicinity of Dalton, as well as in some other places. In the former, the working is usually effected at the depth of from twenty to forty-five feet, but it has been done at leas as well as greater depths. The whole of their cavities are chambered with wood, and cell from a guinea to twenty-five shillings in sinking each fathom, without the wood. The ore runs in veins or seams between the rocks on the north and south part of the quarry, and it constantly dips towards the south-east at the rate of about a foot in five or six. The belt ore is that which has the most greasy appearance, and it is raised with less difficulty, working less hard, requiring less flux, and forming a more soft iron. It is raised from the shafts or pits by machinery of the gin or windlass kind, the men employing picks, picks, and hammers in digging it up. It was formerly got, in some places, by driving levels into the sides of the hills, and conveying it out on railways, in small wagons; but now the other way is mostly employed. Four men get about fourteen tons in the day, in some situations; but in others, double the number are required for getting the same quantity. It is wheeled to distant heaps, from which much of it is sent in small carts to the port of Old Barrow, from whence it is shipped to different parts of England, Wales, and Scotland, at the expense of from fourteen to thirty shillings in freight; and the rest converted into pig-iron by the furnaces in the neighbourhood. Iron-flones and ores are also met with in some other counties, and more to the north of the kingdom, where there are pits and quarries for raising them from.

Lime-flone is a very general sort of flone raised from quarries and pits in many different parts of this country, as in Devonshire, Suffolk, Kent, &c. towards the south, where it lies in vast beds, from which it is dug for use; in the more midland counties, as in Gloucestershire, Shropshire, Derbyshire, Staffordshire, and others, where it exits and is employed in a still greater extent; but by far the most extensively in those farther to the north, as Lancashire, Westmoreland, Yorkshire, Cumberland, and some districts of Scotland. In many parts of the county of Lancaster it is dug and raised from quarries, where it lies in a stratified manner at no great depth from the surface, being got up without much difficulty or trouble; while in other places it is forced from the solid rock, with great labour and expense. This is likewise the case in many other districts. Wherever it is met with, it is almost constantly a quarry material of great value, and which affords much employment to labourers.

In the county of Kent, the banks of some of the large rivers are scooped out into flone quarries in a remarkable manner, some of them worn out and diffused, others in the flate of being wrought. It has been observed, that this is the nearest flone country into which water-carriage can penetrate from the metropolis; and that the original London...
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was built, as well as the modern one chiefly paved, by materials from this district, such as the rag-flone, and the large pebbles gathered on the sea-shores, before the Scotch granite came into use. In the neighbourhood of Maidstone there are the appearances of many abandoned and neglected quarries of this nature; but the most considerable ones, which were lately wrought in that vicinity, are those of Farleigh and Pant. In each of these, blocks of flones, of different kinds, and of every form and size, are met with, being separated by seams, and large irregular masses of earth of various qualities; among the rest, brick-earth of the bell quality. In some places, the flones are buried several feet under these earthy materials; in others, the rock rises to the surface. After this, the quarrymen worm their way; following it, with irregular windings, leaving behind them refuse in greater quantity than the useful materials which they raise.

The flony subllances which are principally met with in them, are of two very different kinds: the one hard, and of a strong contexture, provincially denominated rag, or Kentish rag; the other of a soft crumbly nature, provincially termed baffle. The quarrymen are in the practice of dividing the first into two kinds; what they call the common rag, and the cork-flone, the latter being their principal object in these immense works. It has in its general appearance much resemblance to the strong grey lime-flones which are found in different parts of this country; but when minutely examined by means of a glafs, its fracture and contexture have the characters of the Devonshire marbles; except that the grain of this first of flones is somewhat coarser. In colour, too, it differs from these marbles, having a greater resemblance to the Yorkshire lime-flones. It is used for different purposes; much of it is sent to the neighbourhood of London, where it is burnt into lime, for the use of the sugar-bakers; who, for some reason or other, chiefly employ lime, burnt from this material, or flone, instead of that of chalk. It is likewise made use of as a building material; and, particularly in pedellars, for the posts of cattle-rids and other farm-offices. It is hewn with flone-mason's axes, working with tolerable freedom.

It is very durable, as some part of the basement of Wealdminister Abbey appears to have been built with the flone from these quarries. In this case, it seems to have been dressed smooth; and the surface still remains with little alteration; having withstand the attacks of time with great firmness; it being even now difficult to detect a loosened splinter in the work.

The common rag-flone comprehends all the different kinds which are met with in these quarries, except that of the above, and that which is of the haflocky nature; though the true unmixed rag is a different sort, having characters different from any of the others. In the colour, it inclines more to the red or liver colour, than that of the cork-flone, but otherwise resembles it considerably. Viewed with a glafs, its grain is finer, and the fracture flint-like.

Its uses are, however, but few. Some of the bell and most regularly-faced flones are sometimes laid aside for paving materials; but the large pieces are mostly reserved, in order to be sent by water to the district of Romney Marsh, for the purpose of forming the hard materials of the embankments and jetties, which are there made against the sea. The smaller sorts are, in general, converted to use as a road material.

The haflocky flone appears to the naked eye to be of a soft, white, sandy quality; and its fracture is the same but under the glafs, its grain is fine, its contexture uniform, and so thickly intertrefied with small feed-like granules, of a dark or black colour, as to give it a grey appearance. Sometimes bearing evident impressions of shells. Its text-

ure is loose and brittle; crumbling easily between the fingers into a coarse sand-like powder. It will not burn into good lime, although it is almost wholly calcareous.

Its principal use is that of forming a loose friable sort of roughly sub-foil, in some places, which is admirably suited to the growth of sainfoin, and some other crops of the plant as well as the fruit-tree kinds.

The quarries in several other counties contain flony materials of these different kinds, which are wrought and applied to a variety of different uses in these and other ways.

Quarries of marble are wrought in several districts in different parts of the country, and afford great advantages in various ways. In Suffex they have a marble, which, when cut into slabs, is used for ornamenting chimney-pieces, and many other purposes. It is equal in quality and beauty to most sorts when highly polished. For square building and paving it is also a material scarcely to be exceeded. By burning, it likewise affords a very valuable manure, equal, and by some thought superior, to chalk, being cheaper to those who are near the places from which it is dug. It is found the most perfect about Kirtford, at the depth of from ten to twenty feet underground, in flakes nine or ten inches in thicknes, and called the Petworth marble. It was much employed in building the cathedral at Canterbury, the pillars, monuments, vaults, pavement, &c. being formed of it. And the archbishop's chair is one entire piece of it. Marble is gotten in some of the counties in the middle of the island, as Derbyshire, Nottinghamshire, &c. At Beacon-hill, near Newark, a blue flone for hearths is got, which approaches to marble, and is capable of burning into lime. And in the county of Derby much good marble is raised in different places. In Lancashire there are quarries of fine black marble, and of flones, which approach to, and take on the polish of marbles. In many of the western and northern parts of Yorkshire, marble of various kinds is found, some much resemblimg, and others superior, in close-

ness of texture and dilithenches of colours, to the which it is wrought in Derbyshire. Also a flone, which greatly re-

sembles the marble of that county, and which is capable of receiving much such a polisb, and is nearly of the same colour, mixture, and appearance. On the side of the river Kent, near Kendall, a vein of beautiful marble has been lately disovered in the property of D. Wilfon, esq. of Dallam-Tower; and a main quarry opened upon it. Marble has also been met with on the oppostie bank.

In the county of Inverness, likewise, marble of the greatest variety of colours, and of the most beautiful kinds, has been met with in Benevis, on the property of Mr. Camerton; and inexhaustible quarries of it he untouched in the islands which belong to it.

Besides, this sort of material exisits in immense quantities, in quarries, in many other parts of the kingdom.

Chalk is a material which is raised from quarries and pits, mostly in the southern parts of the country, as in Suffex, Surrey, Kent, Effe, Berkshire, Hertfordshire, &c. It exisits in vast ranges and tracts in most of these districts, whence it is dug up from quarries, at different depths, ac-


cording to circumstances, exposed in shelves to dry, when wet, and then converted into lime for various uses, by means of fire, or employed in its broken and powdery state, with-

out undergoing the above processes, by merely digging it out of such places. In some parts, as in Kent, and the neighouring districts, it is often dug and raised from consider-

able depths, from beds of very great thicknes. And near Reading, in Berkshire, there is a stratum of this sub-

flance,
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flance, which is thirty feet in thickness. It is there used and dug out for manure, and occasionally as a building material, for the latter of which purposes it is very durable. The remains of the abbey of Hurley, and of the ancient chapel, now the parish church, built wholly of chalk, in the reign of William the Conqueror, are, it is remarked by the writer of the corrected Agricultural Survey of the district, still as fresh and found as if they had been the works of the last century. Chalk, when once indurated by the air, has a remarkable property in retarding the action of the weather.

Granite is a flony substance, which is found to exist in some of the southern parts of the country, as well as in the north, but it abounds more in the latter. In the western parts of Cornwall it is in great plenty in the districts of Penwith and Kirrier, presenting itself in large slabs on all the rocky hills or tors, as well as in the walled moors and valleys; and appearing in detached spots, even in the shelly flat tracts. It is of different colours and textures, being adapted to a great variety of uses and purposes, as those of building, and being wrought into columnar masses, eight or ten feet in length, for supporters to sheds, out-houses, &c.; and as gate-polls, and bridges over brooks, rivulets, &c.; as well as in the forming of rollers, rolling, fauting, and pig troughs. It is also an article of commerce to different parts. It is supposed to be exactly of the same nature with the original granite; and there are five sorts of it, which are distinguished by their colours, the white, the daly, or dove-coloured, the yellow, the red, and the black, most of which are charged with a brown and bright silver matter.

The county of Inverness has a great deal of this sort of stone, and there are numerous quarries in it for raising and working of it. The common granite abounds in all the different districts of it. In many places the whole rocks are composed of this kind, which is uncommonly useful for all ordinary purposes. By natural fissures, which run in straight lines, and generally at right angles, it is formed into all sized portions and shapes, having uniformly a plain surface.

And, by means of cutters or transverse lines, these stones are easily quarried, and found in the greatest plenty every where. They are remarkably beautiful, being almost as smooth and regular as hewn stone, and of course well suited for various sorts of building work. The bell buildings of the county-town are of a dark kind of granite, which is very hard and durable, but which has few or no fissures. It is generally found in large blocks, and in many of these parts, there is no other material for building or adding ornament with. The manner of giving it the polish it admits of at the quarries, is by means of small picks, or pick-axes, which are, in fact, hammers with sharp points at each end, in the manner of those employed by millers in preparing their grinding stones. It is a very heavy, compact stone. There is a mixed sort, denominated peasy granite, which consists of white, black, and grey spots, that sparkle beautifully in the sun, and is very ornamental, as well as much used for different purposes, as stairs, doors, and windows. Though this is very solid, and almost without natural fissures, it splits very straight, by means of iron wedges, let in a line, and struck alternately, with a hammer of great power.

A great deal of this kind of stone is imported into the metropolis and other large towns, for paving the streets, &c. It is on the whole a very advantageous sort of quarry material in various parts of the kingdom.

Quarries of free-stone are wrought in a great number of different places. In the more southern parts is found the Portland stone, which is so famous and useful in building. A fort of this kind of stone, which much approaches to it in quality, is also met with in Cornwall. Some like wise exits in Devonshire and Gloucestershire. The Cotswold quarries in the latter, afford free-stone of an excellent quality, particularly those at Painwick, Lodborough, Lockhampton-Hill, &c. It abounds more, however, in Cheam, Lancashire, Westmoreland, Cumberland, and some of the still more norther districts. Several excellent quarries of free-stone are carried on in the sir of these, as those at Runcorn, Manley, &c. where much valuable stone of this nature is raised. The second county also affords equally valuable quarries in many different places, from which vast quantities of the stone are raised, and employed, or sent away to a distance. Those about Ormskirk, Up-Holland, and Wigton, as well as those on all the eastern side, are in general of a very good quality. And in the vicinity of Lancaster there are some excellent ones; that on the moor or common, close to the town, is very extensive, and affords a free-stone that admits of a fine polish. In this district, this sort of stone is met with of a whitish-brown, yellowish, and reddish cast, but the finest is by much the most esteemed. In the eastern parts of Hereford and Shropshire, as at Shropshire, &c., which is raised from quarries, and used as a building material. And a fine-stone exits to considerable extent in others, as in Suffield, &c. that is sometimes dug up, and made use of for common buildings, &c. In Cheshire, on the hills near Macclesfield, about Knutsford, a sort of sandstone is met with, which is particularly well suited to the making of flags, and whetting tools, as well as sometimes to the forming of flates, for which it was formerly much employed. Near Pott-Shrigley, also, a fine sand-stone is found, that admits of a good polish. The quarry has not, however, been wrought for some late years, as from the extreme hardness of the stone, the expense of getting it is very considerable. There are several other quarries of excellent free-stone wrought in the same neighbourhood.

There has been great abundance of free-stone wrought, time immemorial, in the low parts of the county of Perth, and quarries of a greater or smaller sized stone of this sort appear almost in every place, with the exception of the caries. In the lowlands, and near to the eastern sea, the pores and grain of it are greater; but as the mountains are approached, the pores are less, and the grain finer, by which these stones admit a smoother polish. The quarry of Tulloch or parish, called Long-annat, affords a stone of a very excellent quality. It has a white colour, admits of a smooth polish, and refits the influence of the weather. Some of the principal houses in that part of the country, as well as some of the most magnificent public buildings in the capital of Edinburgh, as those of the Exchange, the Infirmary, and the Register-office, are of this stone, and those found at hand. And farther, in some instances it has been carried to the continent. But the quarry of Kingoodie, in the carie of Gowrie, belonging to Mr. Mylne, of Mylnfield, is unquestionably the finest of this kind of any in the county. Altonfiing blocks in great number are raised there, fifty feet in length, sixteen feet in breadth, and three feet in thickness. Such is the demand for this stone, both at home and abroad, that four vessels are employed in exporting it from this quarry. The work is, however, on the declive,
by blasting the flate-flone, and collecting and carrying it out of them on flating roads, in small carts or trucks constructed for the purpose, the levels being below the hills, but not nearly so low as the bottoms of the quarries. Others are wrought by draught roads from the bottoms of them. One man will raise eighteen or twenty hundred weight of flate in one day, where the metal rides well, but lefs in other cases. In some it is dug out by one set of men, split by another, and formed into flates by a third, for which purposes, flat crow-bars, flate-knives, and axes are employed. The flate is divided and distinguished into three sorts, as flirts, second, or third, or London, country, and towns. In the first, or Gofthwaite quarries, the flate has a darkith purple, or black caf, and is worth from forty to forty-four flillings the ton. In the Comilflone quarries it has a fine blue and green appearance, and is much thinner and lighter than the other fort. The Tilberthwaite flate, in fome inffances, splits very fine, thin, and light, but does not cover fo far as oflone of the Gofthwaite and Kirby quarries. This fort is worth from forty-eight to fifty flillings the ton. In fome quarries a fort of rent is paid per ton, on the flate which is raised, as ten flillings for the fift, eight flillings for the seconds, and fixpence for the thirds. In others a certain rent only is paid for the liberty of the royalty, and not a tonnage duty. These rents or duties on the workers of thefe quarries, are probably higher than they will bear, and have enabled the Welsh flate-dealers to underfell oflone of this county.

Weltmoreland and Cumberland, in fome inffances, afford good blue and green flates. In the latter, fome of an excellent quality are gotten in the quarries of Borrowdale, and inferior forts in fome of the neighbouring mountains.

The county of Argyle, in Scotland, in fome parts abounds with flate-quarries, as the tracts about Efdale, from which five millions of flates have for some time been annually collected at the rate of twenty-five flillings the thousand. Quarries of the fame kind are also wrought in many other parts, with great benefit to the inhabitants.

Slate-quarries are formed in many parts of the highlands of the county of Perth, but none in the low. The flates in fome are of a purple colour, in others of an azure blue, and in a few of a muddy, sandy, brown complexion along the cutters. It is well known where the different forts are quarried. The veins of flate-rock seem to run from Drumlanrig in the parish of Auchall, in a north-east direction to Dunkeld; and may be traced beyond the limits of the county both ways. The azure coloured are the bed metal, and rife of a greater size than any of the other kinds. Many of the buildings in different places are flated with this beautiful covering. Into the lower districts of the county, flates are imported from Efdale, and the other quarries on the west coast of the county of Argyle.

Quarries of grey flate exist in many different parts of the county of Inverness, in which the quality is very good, and well suited to the climate. In some places these flates are much preferred to blue ones, as the latter are more expensive in procuring, and though nailed on the roofs of buildings, are apt to be loosened by high winds, unless bedded in lime, which circumstance renders repairs difficult.

There are numerous quarries of sand and gravel to be met with in about every district of the kingdom, which are wrought either for the purpose of supplying domestic uses, or thole of repairing roads, &c. Those of the former fort, which contain the fine white, red, and yellow sands, are by far the most valuable, and wrought to the greatest extent, the materials being mostly dug out from the sides of banks and other places, and but rarely got by sinking the
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The quarries into the more level parts of the ground, though this method is sometimes practised. The matters are commonly raised simply by digging and spades; and thrown into the carts, in many cases, from the quarries and pits themselves. Numerous quarries and pits of this nature exist and are wrought to a very great extent in the neighbourhoods of the metropolis, and with other large towns, all over the kingdom, for the purpose of sale for various domestic uses.

In the gravelly kind, those quarries which abound with the sharp, coarse, flinty, and pebbly kinds, are the most proper and beneficial for the making and repairing of all sorts of roads and carriage-ways. They are occasionally formed by working into banks and steep places, but more frequently by openings in the plain surface. Their depth is sometimes considerable, the materials being raised after being screened, the work, of course, very laborious and troublesome. In other cases, the carts are filled from the quarries or pits without much difficulty or trouble.

Quarries of clay-flint, flint-tiles, eyethe-flintes, and some other plasters, are found of good qualities in different districts. In Gloucestershire they have quarries of blue clay-flint at different depths, lying in beds of the same coloured clay, disposed in layers of from four to ten inches in thickness. The flint in new quarries is estimated by the effects which the atmosphere has upon it from some exposure. The best sort is a very useful material for several purposes. Quarries of flint-tiles principally exist, and those articles are raised from them, in different part of the Cotswolds. The best are prepared about Miserden, Beverstone, Charlton, and Hampton-field, the colour of which is yellow or grey; but another sort, which is red grit, is dug up about Iron Acton, and some other places, but which is less valuable.

There are quarries of eyethe-flintes in many parts of Lancashire, but the best are obtained from thence about Rainford, where they are well wrought and prepared for use. In several other districts, quarries of different kinds of whetting-flintes likewise exist, and are wrought to advantage.

Ochres of different kinds are met with in different places in quarries formed for the purpose of raising them. In the county of Devon, formerly large quantities of various shades between red and yellow, were raised and manufactured in thence about East-roll. Umber, in the parish of Combemartin, exists in a pretty large body. The working and preparation of these are, however, now much less attended to than heretofore.

In Suffolk there are quarries of red ochre about Graffham, and in various places contiguous to the sea, as near Childham, &c. where much is raised, prepared, and sent to London. Ochre quarries also exist in many counties more to the middle and north of the kingdom, from which great quantities of this substance are procured and prepared for sale in different parts from arts and manufactures.

Quarries of plumbago, or black lead, are likewise occasionally found and wrought, in different situations, in different districts of the country. This substance has been met with and raised near the borders of the Bovey river, in Devonshire, in some quantity, and prepared to be sent to Exeter for sale. Quarries of black lead are also found and wrought in Borrowdale, in Cumberland, near to the town of Keswick, to some advantage. And they exist in some of the middle tracts of the island, favouring great benefit to the proprietors of them. In the county of Inverness, there are some appearances of black or pencil lead about Glengary, but they have not yet been turned to any useful account.

In some districts, in the middle parts of the country, quarries of calamine, or lapis calaminaris, are met with, and much of this substance raised from them to great profit. It abounds in the Mendip-hills, in Somersetshire, about Rowbarow, Shipham, Winchcomb, and on Broadfield-down, &c. It is sometimes found within a yard of the surface, and seldom wrought deeper than thirty fathoms. In some places its quality is excellent. It is present in other neighbouring mountainous tracts, and raised with equal advantage.

Quarries of gypsum present themselves in many different parts, and are wrought in some with considerable benefit. In the county of Devon, it lies between the frata of red-flint, marle, and chalk rubbish, about Salcombe, Branscombe, and Beer, being useful for various purposes. Gloucestershire and Derbyshire have quarries of this nature, where there are fine beds of it. Tho' of Ault Cliff in the former, have it not so good, however, as that which is met with in the latter county. In Nottinghamshire it is of an excellent quality, especially that got near Newark and at Redhill. Cheshire has some, but not turned to much account. Westmoreland and Cumberland have good quarries of it, in some places, where a great deal is gotten up, and made use of. And it abounds in different parts of the county of York, where it is raised to advantage.

Marle is an article that is met with in pits and quarries in a variety of different situations, and of several different kinds and qualities. It is found and dug up for use in many places in Suffolk, and the counties more to the centre of the country; but it prevails in the greatest plenty in the county of Lancashire and some others, in which it is raised or worked out from large openings on the sides of hills, high banks, or in the plain surface, and set thickly upon the land. The getting or digging of the material out of such places, is usually performed by means of long iron mattocks, crows, spades, and wooden spiles; large pieces being in some cases forced down, not without danger to the workmen, by driving in the spiles or piles from above. This method is called falling. The work is extremely severe, and commonly done by the rod. The large cloths thus forced down, break into small pieces, and are then filled into carts for the purpose.

Shell-marle, though it is not much attended to in any part of England, is frequently met with and dug up from various parts of Scotland, and employed on the land in great quantities, with much success. The pits and quarries of this kind are commonly wrought with much more facility than those of the others.

Pipe, and other kinds of fine clays, are dug and raised from a fort of pits or quarries, in large quantities, in many different counties. Near Wear Giffard, in Devonshire, much of the first sort is dug and sent coastways, though not in such quantities as formerly. Brown potter's-clay is also raised and sent away in great abundance from the neighbourhood of Fremington. These sorts of clays are likewise found in much abundance in Berks, and still more fully in some of the midland districts, where the pits of them are wrought to a vast extent. They are articles of great importance and utility in several forts of manufactures, and for which there is great demand in many instances.

Alum earth is a kind of stratified matter, which is met with and raised from pits and quarries in a number of different situations, and various parts of the kingdom. In some they are wrought to very considerable extents and advantages, but in others in far less degrees, and with much less success.

The frata of this earth are dug and got up in different manners.
manner under different circumstances, but mostly by means of strong crowns, picks, and other tools of a similar kind, being wrought in somewhat the same method as in the cafes of marl. The buffmel is usually executed by common labourers.

Fuller's-earth is another material of this nature, which is dug out of the ground from pits and quarries at different depths in several parts of the country. In some it is very abundant, and of a rich good quality, as in those of the middle and more northern parts of the island, forming an article of great use and demand in several branches of buffmel. In others it is of a much less valuable nature, being far less in request. That which is found about Til-lington, in Sussex, is consumed in the neighbouring fulling mills. The mills of this fort in Yorkshire, and other parts also, consume immense quantities. The material is raised from the places in which it is found in much the same way as many other earthy substances, but it seldom requires so much digging, as it is a far less hard matter.

Fuller's-earth was formerly got up from pits and quarries in the neighbourhood of Maidstone, in Kent, and much ground wrought over; but the beds of sand by which it is covered are of such depths, as to render the works of little value or importance.

Quarries and pits of mineral peat-earth are found in some districts, and much of the material dug up from them, and made use of when prepared upon land. The vale of Kenten, in Berkshire, contains vast quantities of it, as well as some other parts. It is a stratified substance which is dug up from the surface at the depth of from one to six feet, lying below strata of small stones and calcareous matter. In raising it, a peculiar kind of spade is made use of, which cuts it in long rows, something like soap, which, when dry, are burnt into ashes and laid on the land. This substance is found to contain the oxys of iron, gypsum, and the muriates of sulphur and potash, in the proportions of forty-eight, thirty-two, and twenty parts to that of one hundred.

It is suggested by the writer of the work on "Landed Property," that in most mountainous districts, and many low Tenny counties, immense collections of vegetable mould or peat-earth lie in a state of neglect; even in places where they might be converted to valuable purposes; not only as sources of fuel merely, but as manure, either using the vegetable matter in its raw state, or after being reduced to ashes. In all these situations it might be readily dug up from different places, and applied to different uses in each of these ways, the pits or other spots containing it working in a very easy manner. The ashes of it are only employed on any large scale in the above county.

Culm, coal, and cannel, are articles of the fuel kind, which are found in a vast number of places, all over the kingdom in pits, mines, or quarries, and which are of the greatest importance in many of them. Speaking of coals, the author of the work on "Landed Property," considers them as rising in the minds of most men, far superior to most other productions and subterraneous matters, whether they are held in the light of agriculture, manufactures, or national defence. It is asked, if it were not for the colliers of this country, how many hundred thousand acres of its land, which are now appropriated to cultivation, would be required for the production of fuel? How many manufacturies, especially those of iron, which are so very valuable to civilized society, would be cramped, retarded, and stopped, in their progress and operations? And how many hardy seamen would be wanting to its navy? Surely, in his opinion, an indigenous production and material, on which the prosperity of the country so greatly depends, is entitled to the guardian care of its government; to ascertain the present expenditure, and the probable stock which is remaining. Let us not, it is remarked, play the spendthrift, and, by the follies of a day, entail centuries of want on generations to come, and the curses of millions on the memory of the present times.

In endeavouring to find these sorts of substances in parts where pits of them have not yet been wrought, the searching, it is supposed by the same writer, should, in general, be done by the land proprieters of the particular places, in a conjoint manner. There are, however, certain instances, in which individuals may prosecute the search with propriety, and in the most beneficial manner. In doing which, the principal things to be guarded against are those of misjudgment and imposition. Hence the necessary prudence of endeavouring to procure persons of skill and integrity for making such searches; which, are, in the first place, to be attempted by a close investigation of superficial appearances, and then where those are favourable in their nature, by the use of the boring rod or tool. It is supphsed that, at present, there are none who are equal to such undertakings, except those who have long conversant with the buffmels of coal works; men who have an interest in the existing colliers or works of that kind. On this account it is thought to become a matter of common prudence, in a given situation, to endeavour to procure an undertaker or overseer from a distant work; or such a one as can have no counter-interest to that of his employer; and then, closely to connect and bind them in one common interest. After having had different occasions for considering the subject, and for bellowing no small thought upon it, the writer is of opinion that the most eligible plan of proceeding, in such cases, is that of agreeing with an overseer, or undertaker, to pay him reasonably, but not extravagantly, for his time, and for his actual expenses in prosecuting the necessary searches; and, further, to agree to give him, in the event of success, a reward sufficient to call forth his best exertions; such reward to be payable, not on finding coal, but whenever the work, to be established in consequence of the discovery, shall have cleared the amount. In this way the proprietor will feel himself secure, while the person employed has the most powerful stimulus to industry, attention, and the accomplishment of the object of the undertaking.

Culm and coal have been met with and wrought in some degree, in Devonshire, Suffolk, and some other of the southern parts of the island; but they exist much more plentifully in the midland and more northern districts, as well as in some places in Wales and Scotland. In Gloucestershire, coal abounds in most parts of the forest of Dean, and its vicinities, and probably to within a small distance of the county-town, as at Newent and Painsley, where pits are established. Those of the forest tracts are very numerous, but not fully wrought for want of sufficient draining. Pits of this kind also exist in many places, in the lower vale part of the county. In this district, however, the coals are no where of the best quality.

In the counties of Salop and Somerset, coals also prevail very much, various pits of them in both, being wrought to considerable extent. Those in the northern part of the latter district, have strata of them which form an inclination of the plane of about nine inches in the yard; and are nineteen in number. They are seldom wrought where less than fifteen inches in thickness, but they vary from ten inches to upwards of three feet. The working is performed at considerable depths, especially since the establishment of improved machinery, and other means for raising them. The coal
coals is of the first quality, being pure and durable in burning, and from its firmness, largeness, and strength of grain, capable of being conveyed to any distance without injury. At present the quantity raised in these pits, is from fifteen hundred to two thousand tons weekly, but much greater supplies could be afforded, if they were wanted. The works are twenty-five in number, some of which afford a good profit.

The pits in the southern part are upon a more limited scale of work. In them the strata of coal form an inclination of the plane of from eighteen to thirty inches in the yard; but in some it is destroyed, and they descend in a perpendicular manner. There are, in number, twenty-five, which are in thickness from six inches to seven feet, being rarely worked under eighteen inches. The depth of working is middling, but will be increased. The quality of the coal is not the best, but tolerably good. The quantity now raised from these pits is from eight hundred to a thousand tons in the week, which might be easily extended. The working profits are by no means great. There are pits in other parts, but they are not many, or much worked.

Against the apprehension of pits of this nature being exhausted or worn out in these places, it is contended that more than treble the present quantity is capable of being raised from the works already carried on, and that this increased quantity might be supplied for several hundred years to come.

The works and quantities of coals contained in the counties of Stafford, Derby, and Nottingham, are likewise very great, and mostly of good kinds; pits of them being carried on in many places to vast extent.

Cheshire, too, is a coal district, in which a great variety of works for raising it are established in different parts, and much of it, which is of a very good quality, gotten up. The strata of coal here in many cases are several feet in thickness; at Wirral the seam is five or six feet thick, and the works extensive under the channel of the Dee. In some works the beds of coal lie at the depth of from seventy to one hundred yards below the surface of the ground, and are of different thicknesses to ten feet or more.

In Lancashire, coal of good sorts is most abundant. The beds of it run across the county in somewhat three different parts, as towards the south, nearly in the middle, and on the north-east part. Those in the two first are of considerable breadth and thickness in different parts, but the third is much less broad and very thin in many places. They all run, in some degree, from the north-east to the south-west, constantly keeping somewhat the same direction, though occasionally branching out in a lateral manner to some extent. The works on each of these different lines of coal strata, especially the two most towards the south, are very numerous, and, in different instants, of very considerable extent. There are some also established on the northern line, but they are of a far more limited nature. The layers or strata of the coals are of various widths, from a few yards to a very great distance, and their depths or thicknesses from a few inches to fix or seven feet. They lie at very different depths from the surface of the earth, according to circumstances and situation; on the eastern side of the county they sometimes nearly appear on the top of the ground, while, in the middle, and towards the south-west, they are often a considerable number of yards deep. All about most of the large towns in the southern parts of the district very extensive works are established, where immense quantities of coal are raised for home use, as well as being sent by canals, and, in some cases, for exportation. They are a sort of material which is of vast importance to the manufacturing state of the county, and which contributes greatly to its prosperity. The quantity is so great, when confederated as a whole, that they would seem to be almost inexhaustible.

The cannel coal, which is a sort that has some resemblance to fine black marble, is principally found and raised in the tract about Haigh, near Wigan, which is not more than a few miles square. It lies in pretty thick strata, at the depth of from five to seven or eight yards from the surface. It is of a very fine, hard, inflammable quality, being got up by sharp picks, often with considerable labour, and for which there is much demand, for domestic use, in the neighbourhood.

Coals also abound in the neighbouring counties of Cumberland and Northumberland, being found in many parts of the eastern mountains, and, with not many exceptions, all along the tract, which extends in different degrees of breadth from Sebergham to Whitley, and along the coast to Maryport, forming and comprehending a district of about one hundred square miles, in the former. And they are met with in great plenty throughout the greatest part of the latter county, particularly in the lower district of it; being of the best quality, and the most numerous, and thickest seams, in the south-east quarter; whence those vast quantities are exported which supply the great consumption of the London market, as well as the coaling and foreign trade. A trade which is the foundation of the commerce of the country, and the principal source of its wealth, as well as a never failing nursery for some of the best seamen of the British navy. The former county has likewise works which supply prodigious quantities, both for home consumption and the coalways and export trade. Cannel coal is also raised in this district in pretty large supplies in the neighbourhoods of Calbeck and Bolton.

Large portions of this article are likewise raised in the works in the county of Durham, which in some parts are carried on with much spirit and enterprise.

Coals are found, and raised in full supplies, in many places, in most of the counties of Scotland, to far as Perthshire; but they have not been met with any further towards the north in any sufficient quantities. Where they exist, to any extent, in these situations, they are generally of good kinds, and capable of being got up without any great difficulty, seldom lying at any very great depth below the surface.

It has been contended by some, that the coals in the pits and other places, in this country, are inexhaustible, while others maintain the contrary to be the case; as the matter relates to the county of Northumberland, we have the following calculations, on the authority of the writers of the Agricultural Report of that district. And they may perhaps equally apply to others. It is supposed, that towards elucidating this point, it may be of some use to estimate what number of acres are wrought yearly in the county to supply the necessary consumption. In order to accomplish this object, the thickness and number of workable seams of coal must be first ascertained; for which purpose they have been favoured with sections, exhibiting the thickness and depth of the various strata, in some of the deepest pits in the county, one of which has a depth of two hundred and seven yards, with fifteen seams of coal; the other a depth of two hundred and forty yards, with fifteen seams; consequently, if the medium be taken between the two, it will be nearly fixed yards thick of workable coal; from which may be formed, it is thought, a calculation of the quantity of coal in an acre of ground, supposing the aggregate thickness of the various seams amount to five yards.
An acre of ground contains 4840 square yards, which, multiplied by the thickness gives 29340 cubic yards in 6 yards, an acre.

From which deduct 3d for waste and the parts or pillars necessary to be left in working there remains 19360 cubic yards to be wrought.

And as three cubic yards of coal, when wrought, afford a Newcastle chaldron, therefore, 19360 = gives 6453 Newcastle chaldrons per acre, divided by 3.

The coals exported yearly from the rivers Tyne and Wear, with Hartley and Blyth, amount to about 825,000 chaldrons, which, with the home-consumption of the two counties of Northumberland and Durham, will make the quantity of coals raised yearly about 1,000,000 chaldrons.

And the chaldrons
raised yearly

1,000,000
= gives 155 acres nearly

divided by the chal-
drons per acre

6453
per year, cleared of coal 5x yards thick.

And by estimating the breadth occupied by the caking coals to be on the average eight miles broad, and twenty-five miles long in the two counties, it is found that there will be about two hundred square miles, or 128,000 acres of coal proper for exportation.

From Newcastle 510,000 chaldrons.
— Sunderland 315,000 ditto.

In all 825,000

Then the whole area 128,000 = 825 years. The time divided by the
yearly consumption

155
will be wrought out.

It is, however, suggested, that there are some reasons to suppose that a thickness of seam equal to six yards will not be obtained all over an extent of two hundred square miles, probably not more, on an average, than four yards; in which case the coal will be exhausted in five hundred and fifty years. And if the aggregate thickness of the seams to be obtained should prove only three yards, then little more than four hundred will be the term of continuance; but it is probable, it is thought, that before the half of that time be elapsed, the price to the consumer will be considerably increased from the increased expense of obtaining them, and the increased length of carriage from the pits to the rivers; this last, it is presumed, may be reduced in some situations, by adopting canals instead of waggon-ways, which, it has often been observed at, have never yet been attempted. From this investigation, it is suggested, that the apprehensions of exhaustion are not so chimerical as they have been supposed and represented to be by some persons. When, however, the vast extent of the working and unwrought tracts, in the different parts of the country, are considered, there cannot be any grounds for fear, in this respect, for a vast length of time yet to come.

Pits, some what of the quarry kind, are wrought in one district of this country, that of Cleebride, for the raising of coal, in some of which large quantities of this material are procured, from different depths, and different thicknesses of the strata of it. In the getting of it different means are employed, as those of blasting, picking with implements, for the purpose of roofing, the using of horses, and machinery wrought by steam, for forcing up the sub-

fiance, and some others. The digging, raising, and working of this article, employs a great number of labourers, and it is of much importance to the county in many points of view.

But though this sort of material is found in several different parts of the county, pits, or shafts of it, are at this time only wrought in the vicinity of the town of North-

wich. This arises from a great many different causes, but principally from that of the want of water-carriage for the conveyance of the material from them. The number of pits or shafts, which there are at this time in work, for the purpose of raising this article, are about a dozen. They are by much the most commonly made in something of the square form, being secured on the sides by means of strong timber, but they have occasionally a round form, and are walled on the sides with bricks.

The beds of this material, that are to be raised, are wrought at various depths, the deepest being in general the most pure, and they vary equally in their thicknesses and directions, as suggested above. In some cases the beds are of the greatest thickness, the more they approach the north-east, decreasing in a gradual manner, in their course to the south-west; and in some instances they incline from north-west to south-east, dipping at the rate of about three feet in twenty-seven or thirty.

The strata, which are passed through in getting at and working the rock-fall, lie in a very regular manner, and confide, in general, of a hard clayey substance and a sort of gypseous material in mixture in various ways and proportions, that of the latter kind being the most predominant as the pit or shaft approaches the rocky saline substance. In working, the clayey matter is designated by the name of metal of the several different colours belonging to that sort of substance, and the other material by that of plugger. These strata are mostly of a solid compact nature, but occasionally broken in particular places, when the metal is termed flaggy by the workmen.

In the business of working the pits, and raising the rock-fall, the rocky beds are reduced into pieces of proper sizes for the purpose, by means of blowing them with gun-powder, and those of splitting and dividing them with hammers and proper wedges for such uses; a good secure headway or roofing being constantly provided in the first place, to the opening from which the salt-rock is to be taken, which is effected by the use of small sharp picks, carrying on the work in a plain simple chambering manner.

The workings are sunk from these chambers to different depths, as the nature of the beds of rock, and the quantity of the purer kind of rock-fall, or Prussian rock, as the workmen term it, may direct; but commonly not above fifteen feet. Occasionally the roofs or headways of the pits or shafts are supported by considerable square pillars disposed in a somewhat regular manner, but in other cases they are wrought out in a sort of long openings, according as the workmen are inclined.

In getting the rock-fall, the workmen are paid by the ton at the rate usually of about twenty shillings, they finding the gunpowder and other tools.

In raising the salt from the pits or shafts, hores were formerly entirely made use of, but within these few years, recourse has been had to the improved steam-engine, as already noticed, though it is not yet generally employed at every pit. See Rock-Salt, Rock-Salt Pits, Salt, and Salt Brine Springs.

It is evident from the above account, that in whatever way they are considered, the quarries of different kinds in this country are of very material importance to its prosperity.
prosperity and convenience; contributing largely to the
carrying on of different sorts of works and improvements.
Without them much useful labour must be wholly at a stand;
a variety of necessary businesses be incapable of being car-
ried on; and the effects of it upon various arts and manufac-
tures, be much too serious to be thought upon. In
short, the numerous substanacies of different kinds, which are
taken from the bowels of the earth in this country,
constitute one great source of our national wealth and pro-
sperity.

Quarries, Pits, c. Draining of, the proper, most
convenient, and appropriate means of rendering all such forts
of works dry, free from water, and in a fit state to be
wrought with ease and advantage. In the effectual per-
formance of all kinds of undertakings of this nature, there
is occasion for the application of the same principles, which
are spoken of and explained in considering the nature of
draining land in general, and the particular manner which
is necessary to be pursued in the practice of spring drain-
ing. See Draining of Lands, and Spring-Draining.

There can be no doubt, indeed, but that the having re-
course to such principles, and the modes of practice result-
ing from them, will be equally expeditious, beneficial, and
successful, as well as in many situations of very material
importance, in the various cases of this fort, as in those which
have been mentioned; by leading to and introducing the
most ready and easy means of diminishing the quantities of
water, which are frequently met with in the course of
working them, and which not unfrequently obstruct and
hinder in a very high degree, but sometimes wholly put a
flop to the work which is carrying on in them. Such, at
least, is very often the case in quarries of the free-borne,
flint-borne, flag-borne, marle, and other kinds, as well as in
pits of the coal and other forts. The want of this fort of
knowledge, of course, is one great cause why such a number of quarries and works of that kind, in different
cases, often lie altogether, or for a great length of time, in
an unwrought state; which might otherwise be wrought to
very great advantage.

As it is now well understood, that most springs and sub-
terraneous collections of water are formed and supplied
from such grounds or lands as lie higher than that of the
places where they are found or met with, which, on ac-
count of their being of an open or porous nature, admit
that of rain and other sorts of moisture to filtrate and pass
freely through them, which hindering and deferring to very
great depths, through such open materials of the rocky,
flinty, gravelly, and other loose qualities, before it becomes
impeded and obstructed by some sort of impenetrable strata-
um or layer of an earthy or solid flinty nature, such for
instance as those of pure stiff clay or compact rock; it may
happen, that in many such cases, in sinking pits or shafts
for flint, coal, or any other kind of subterraneous material
near the bottoms of hills or high grounds, beds of quick-
sand will be met with, and dug into, which are so full of
water, that to pass through them becomes a most trouble-
some, difficult, and expensive piece of work, and some-
times impossible to be performed, but which, from knowing
that the water proceeds from the porous ground that lies
above, it may often be practicable to intercept and cut off
the greater part of the water, before it reaches such sand
beds in the quarries, pits, and shafts, by the means of
boring into and tapping the water at the tail of the banks
of this nature, provided that the ground naturally declines
lower than the place where the sand is found in the quar-
ries, pits, &c., and the whole or most of the water be
drawn off, and diverted from them at a comparatively
trifling expense to that which is employed as the common
remedy in such cases and circumstances.

In order to accomplish this intention, it will be necessary,
in afending from the quarry or pit, to carefully examine
and ascertain, if at any place higher on the declivity, any
porous stratum, bed of rock, sand, or gravel, tail out, which
may conduct and convey the water contained in it
to the sand bed, which is below in the works; and where
any such bed is found, to cut or bore into it in such a
manner as to form a drain, that is capable of carrying away
the whole or the greatest part of the water, and of
course to clear, or diminish the quantity contained in the
quarry or pit, which would otherwise have continued to
decend through such porous substrata or beds, and have
continued to fill the sands, or quarries and pits.

But although this part of the business may have been ac-
complished, and the supply of water from the higher ground
entirely cut off, a sufficient quantity to injure, hinder, and
inconvenience the working of the quarries or pits, may yet
continue to drain and ooze from the sides of the sand beds,
notwithstanding they should happen to dip towards the
lower ground, in which cases, however, that water may
readily and with great ease be commonly drawn off at some
particular point in it.

In order to effect this, and thereby remove the in-
convenience of this filtrating water, in descending from the
quarries or pits along the declivity, it should be endeavoured
to discover and ascertain, at what particular point or place
in the low ground, the sand terminates or tails out, which
is mostly best accomplished by means of proper levelling;
and if there should be there any appearance of the waters
having a natural outlet, it may, by means of making in it
a deep drain, be more readily and effectually drawn off and
removed; as springs, for the most part, naturally pass
and flow through narrow, winding, convoluted openings,
or perforations; of course, whenever the orifices or pendants
are opened, enlarged, or made lower than before, the dis-
charge of water becomes greater and more expeditious.
Where, however, there happens to be a deep imper-
vious layer or covering of clay, or other matter of a
similar nature, placed above or upon the termination or tail
of the sand, the drain need only be cut down to it or a
little way into it, as by means of boring through it, or the
remaining portion of it, a ready and easy outlet or pendant
may be given to the whole of the water, that may be con-
tained in the sand-bed or other porous stratum.

This mode of draining quarries and pits may often be of
great utility, advantage, and convenience, as it will also,
in a great degree, remove, or at any rate relieve, the
trouble and difficulty, that would afterwards have attended
the sinking the quarry, pit, or shaft; as the water thus
drawn or cut off, must of necessity diminish and reduce the
quantity, which would have been found at a greater depth,
the fame body of it probably passing downwards from one
stratum to another, as far as they continue to be porous, or
capable of admitting it. Therefore, it is of very material
importance to drain and lay dry all such ground as is situated
higher, but contiguous to quarries, pits, or other deep subter-
naneous works of the same kind, for the above stated reasons.

And it may, in general, be accomplished with but little
trouble, difficulty, or expense, by adopting the same prin-
ciples, and the same means.

But in regard to the removal of the water found and con-
tained in the bottoms of such quarries, pits, or deep works,
it must be drained off and got rid of in some different man-
ner, as the level of the ground may probably be, or decline,
nowhere lower than the mouths or openings of such quarries,

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pits, &c.; as it is solely and particularly on the supposition, and in such cafes as where the direction of the different strata and sand-beds have a dipping position with the natural inclination of the surface of the land, and not nearly horizontally, that the method of proceeding which is stated above is practicable, or capable of being employed with any fort of advantage. But should they, for instance, be in a reverse or contrary direction, there is but little possibility or chance of accomplishing the object, the removal of the water, unless by diffusing or hitting on their terminations, somewhere on the opposite sides of the hills or elevations, which in some cafes may very nearly or exactly be found out, by ascertaining the precise inclination or direction of the materials of the quarries, pits, &c. and by a careful and exact use of the level. But this will be much better comprehended, and a more clear, full, and perfect notion of its nature afforded, by the section figure in the plate on draining quarries, pits, &c. in agriculture, as given by Mr. Elkington, in his work on that subject.

This is the manner which is to be pursued in preventing the effects of water, or cutting off that which is met with in sinking the quarries, pits, shafts, or other similar works, before reaching or arriving at the stone, coal, or other fort of material that may be wanted; but that which is found in the bottoms of these different kinds of undertakings, or which proceeds from the rocks or their sides, or in other ways, in the course of working them, is commonly got quit by means of some fort of machinery, as that of the engine or other kind of pump, in order to affist in working of which, the water gained by cutting the drains already noticed may be particularly useful, especially where the usual stream for that purpose is insufficient in faving the great expense of working such machinery by the power of steam. But without the aid of a natural stream, which is capable of being converted to this purpose, it is rarely possible to find, by means of drains, or in any other way, a quantity of water sufficient to drive such weighty machinery, in a situation of proper height, to have the full and necessary command of it. However, in many cafes it may be an acquisition of great utility and value. It is explained at fig. 2, in the same plate.

In some situations, where a full and proper command of water can be had, and where the entrance to the quarry, pit, shaft, &c. is also suitable for the purpose, the use to which it may be converted and applied is still more important and advantageous, as the driving of machinery for bringing out the various kinds of materials, and at the same time working an engine-pump, in order to clear the works of the subterraneous water which flows from the cavities of the rocks, which are met with in working these forts of pits, &c.

It has been remarked in Mr. Elkington's work on drainings, in these cafes, that the duke of Buccleugh's coal-works, near Langholm, in the county of Dumfries, afford a striking example of this, as well as of the superior powers of water and machinery, when properly combined, and where a command of the water can be had, and when the latter is constructed on proper principles, and conducted with that care and ingenuity which are requisite in such difficult undertakings.

In working quarries of lime-stone, free-stone, and other forts of materials, it is not unfrequently happens, that, at a certain depth, part of the rock or other body, which contains the water, is hit upon, by which they are soon so filled with it, as completely to put a flop to the work proceeding any deeper, where the bell and often the greatest part of the stone is situated. In all such cafes, the most usual remedies have been, either the erection of a wind-mill pump, to draw out part of the water, as the whole cannot be taken away by such means, or the opening of a new quarry or pit contiguous to the other, which at the same depth mostly meets with a similar obstruction, or the bringing up of a very deep cut, often at great expense, under the level of the water, from the nearest declivity or hollow that can be met with. However, by the following method, all quarries of lime-stone, free-stone, marle, or other materials of the same nature, which are liable to such fort of obstruction, may be completed and effectively cleared of the water at but little expense; while, at the same time, the drain which is made may serve the double purpose of that, and the laying of the wet ground, caused by the spring contained in the rock, which is found contiguous to it, dry.

There commonly lies, immediately under the rock, a bed of strong, stiff, retentive clay, which absorbs all the water received and retained by that rocky stratum, and which being, at the same time, bound round on each side by a covering of the same fort of clayey material, or other stiff earthy substance, is not able to discharge itself, and of course constantly remains orstands full in the rock, so as to prevent the working or taking out the stone from the bottom.

In such cafes it is necessary, in the first place, to endeavour to find to what side the rock dips or inclines, which, in general, may easily be ascertained by the appearance of the surface, in examining the surrounding ground, and the aid of a proper level. When this has been discovered and fully ascertained, a suitable drain must be cut through the clayey covering to the rock, by which the water will be drawn off, which, for want of a proper outlet, formerly stood pent up in the hollows and cavities of the stone stratum or body. This is further and more fully explained by figs. 3 and 4, in the same plate.

But, in some cafes, this fort of evil or inconvenience may be removed and remedied in a different way. As it frequently happens that a bed or body of the same stone, which has a close, compact nature or solid, is found lying under one which has a more open porous texture, with hillocks and cranks in it, that are diffimible of water, which obstrufts and keeps up the water in the upper bed or layer, in such a manner, that not any of it can pass or filtrate through it to an inferior, or still deeper open stratum or bed; and on linking or cutting through this compact bed of stone, another layer is met with, which is of so open and porous a nature, as to admit the reception of any water from the above one, which may come upon it.

And sometimes a bed of gravel or sand is found under that of the close stone, which being still more capable of absorbing or taking up any water that may be let down to it, is far better and more properly suited for the purpose of clearing the upper bed of stone from water, than a stratum of open stone itself.

Therefore, when this is discovered and ascertained to be the case, and the water is kept up by the second bed of stone, so as to be injurious and hurtful to the working of the upper bed, and which will be equally so in working the second; the work may be greatly freed and relieved by boring through the close bed of stone, and letting down the water into the more porous one below, or into a stratum or body of dry sand or gravel, should there be such a one underneath it. But in place of boring, the sinking of small pits through the close stone is a more effectual method of letting down the water, though a much more difficult one in the execution.

The methods of digging and boring, even in the bottoms of quarries, pits, and shafts, where pumps and other machinery of the same nature are made use of, as has been noticed above, may, in some cafes, not only be practicable, but advantageous for letting down the water which they contain into an inferior open stratum.
That of boring has been practised with complete success in the case of a colliery in the county of York, which had been wrought many years, and in which the water was raised about sixty yards by a steam-engine; the proprietors of which, on boring down from the bottom of the pit next to the engine-pit, to the further depth of about ten yards, in order to ascertain the depth or thickness of a seam of coal, which was supposed to lie below those then wrought; the workmen, on taking out the boring rods, found that the water from the works, which usually ran across the bottom of this pit to the engine-pump, now ran down the holes they had made. And that the steam-engine, on being set to work, contained little or no water, it having escaped through these holes, and continued to run through the same ever afterwards, rendering the pump useless. It is remarked, that this instance of water at so great a depth from the surface, finding a passageway at a further depth of ten yards, or less, and immediately below, is extremely singular and striking in its nature. The situation was much higher than the nearest contiguous valleys, or the level of the sea. Trials of this sort can seldom be made, therefore the cases are rare, uncommon, and curious. But in extensive tracts of level land, where lakes or morasses have been formed, and which cannot be laid dry by cutting open drains, or driving levels through rocks, except at an expense for which the lands, when drained, would never compensate, the above instances warrant the trial of experiments with boring rods, which, if not attended with success, can be made at little expense.

In the county of Lancaster, as well as in some other parts, flint quarries are cleared of water exactly in the manner which has been already pointed out, but which fig. 5. in the plate will explain much better.

The success of the practice has likewise been farther shown by the late T. Ecclefeon, esq. of Scarifibrick-hall, an ingenious and extensive proprietor of land in the same neighbourhood, who remarks, that in flint quarries thereabouts, wells or pits are occasionally sunk to the open bed, which have proved serviceable. This mode was practised in a flint delf near the above town in a very beneficial manner. But in order to lay the delf more effectually dry to a greater depth, Mr. Elkington, on viewing the surrounding ground, marked out where he thought the rock terminated, or tailed out, and at the lowest level let out a drain to be cut and carried up to the rock, part of which work has been executed, and a very considerable flow of water comes from it; but on account of its great depth, sixteen feet, the whole will not be finished before he has seen the work again. The drain he has thus laid out is about ten feet lower than the bottom of the flint quarry, and when completed, will lay the head or body of flint dry lower than the present floor. All rocks, for the most part, where they terminate, are succeeded by broken loose flakes of the same nature as the rock, and they are frequently, nay almost always, succeeded by land, which, when in a thick bed, and of a running nature, such as quicksand, often cause great expense in cutting through to the tail end of any rock. This is more fully explained in speaking of the manner of draining in hilly lands, and where the soils are of a mixed nature. See Spring-Draining.

Therefore, in all such cafes as this, where there is any danger of meeting a quicksand, boring or flooding pits through the bed of close flint, is by much the most advisable, and at the same time the least expensive method that can be pursued.

The situations of marl pits are for the most part such, that they require very extensive cuts to be made through some parts of the surrounding banks or sides of them, in order to convey off the superabundant quantity of water which prevents their being dug or wrought to advantage. This business might frequently be effected in a much less troublesome and expensive manner, by the method of letting the water down by means of sinking pits or openings through the retaining and upholding stratum underneath the bed of marl, into some absorbent porous body of materials lying still deeper, which is capable of receiving it. Where the space of ground that is occupied by the marl is of considerable size, several pits will be required, in order to effectually carry off the water; and where it is necessary that they should be so deep as to be in danger of falling in, they ought to be wall ed round the sides, or filled up to near the top with loose stones, through which the water can seep and find its way. And any such holes or cuts as may be necessary for the purpose of collecting the water must be so formed and conducted as to lead into the pits. But in many cafes the water may be removed and got rid of in a still more easy manner, especially where the situation of the ground is favourable and suited to the purpose. In instances where the surrounding banks decline or fall on the opposite sides lower than the water, by cutting drainages into them, and boring with an horizontal auger into the tails of the strata containing the water, it may be drawn off and brought down to a level lower than that of the bed or body of marl. And as this water is not frequently supplied by a spring which rises in some part of the higher ground, and descends into the place where the marl is found, it will be necessary, in all such cafes, to cut off the source of it, and divert the flow of water into some other channel; as by that means the quantity of water below will be lessened, and more easily and readily carried off by the pits or drain which may have been formed.

Mines and shafts, for the purpose of raising different sorts of metals, are often much impeded, or wholly prevented from being wrought by the water which is brought into them from a distance, by various kinds of mineral strata. In many such cafes, the water flowing in this way may be intercepted, by making cuts up to the lowest banks of them, from some neighbouring water-courses, or other convenient outlet, and then boring or digging pits in the bottoms of such cuts, when the metals to such depths or levels will be rendered free from water, and capable of being wrought. This will, however, be more amply shown in considering the manner of draining, in some cafes of wetness, caused by springs arising in this way. See Spring-Draining.

In removing the water, or freeing the bottoms of quarries and pits from it, where machinery is required, the writer of the work on "Landed Property" has remarked, that in cafes where half-draws are found to be impracticable, well-draws and pumps become necessary, and are the most proper, as they may be wrought by water, where streams can be conducted to them; or by wind in high exposed situations; or in works of consequence, where fuel is moderately cheap, by small steam-engines. However, in instances where large bodies of water are required to be raised, and discharged at the height of a few feet only, marl-mills, such as are made use of in low marl-land districts, are found the readiest and most useful kind of machinery for the purpose.

In some cafes of this nature, the bottoms of quarries, pits, and mines, may be cleared from water, simply by forming openings into them from some parts of the neighbouring ground where it falls lower than the levels of them, at sufficiently short distances, without any other more expensive works being undertaken for the purpose. This should always be fully considered before any means are resorted to.
for laying them dry, as it may occasionally be the saving of much labour, trouble, and money.

Quarry, in Glazery, a pane, or piece of glass, cut in a lozenge, or diamond-form.

The word seems formed by corruption, from quadrat, (which see); unless we will suppose it to come immediately from the French quadrat.

Quarries, or quarrels of glass, are of two kinds; viz., square and long, each of which is of different sizes, expressed by the number of pieces which make a foot of glass; viz., 8ths, 10ths, 12ths, 15ths, 18ths, and 20ths; but all the sizes are cut to the same angle, the acute angle being 77° 19' in the square quarries, and 67° 22' in the long ones.

Quarry, in Falconry, is the game, or fowl, which the hawk is in pursuit of, or has killed.

Quarry, among Hunters, is sometimes used for part of the vicere of the beast taken; given by way of reward to the hounds.

Quarry-Cart, a name commonly given to that fort of cart which is principally employed in the work of quarries, and which is generally of a low, compact, strong kind, in its nature, form, and manner of construction, in order to furnish heavy weights, and receive them without difficulty, or the danger of being destroyed. Carts for this purpose should always be made of well-seasoned wood, be well put together, and have sufficient strength of timber in those parts where the main stress of the load is placed. See Cart.

Some quarry counties have well-formed carts of this nature, as many of those towards the northern boundaries of the kingdom.

Quarry-Waggon, or Truck, a small carriage of the low truck kind, which is much employed in the bourns of quarries, especially those of the slate kinds, for the purpose of holding and conveying the rough materials, which have been blown from the large mafly rocks, or separated in other ways, out of or from the quarries and pits in which they are situated and contained, to the places where they are to receive their different preparations and shapes.

It is formed and constructed on a frame somewhat similar to that of the common barrow, and mounted on two light iron wheels on the fore part, having two feet behind, projecting from the frame, bent something in the manner of the letter S, and of sufficient length to let it stand or rest in a horizontal position while it is in the act of being loaded. These feet are usually made of iron, but they may be formed of other materials. A fort of inclined plain is formed from the bottoms of the quarries or pits, up which it is forced, with great ease and facility, by the workmen, or small animals of the horse kind, after being filled with these forts of heavy materials. It is a very useful and convenient machine in this application, being met with in most of the slate quarries in the northern part of Lancashire, as well as in those of many other districts of the kingdom.

Quarrying, the business of directing and conducting the nature and management of splitting the different kinds of quarries, pits, and shafts, as well as of the different forts of work which are necessary to be undertaken, carried on, and performed, in the several different descriptions of them; such as those of separating, getting up, and preparing the various kinds of materials for use in the arts, or in other ways. It is a practice which requires considerable knowledge and experience, to be fully master of it in all its different bearings and intentions. See Quarry, and Quarrying Slates and Stones.

Almost every fort of quarrying-work requires a different kind of management, not only in the opening and working the quarries and pits in the grounds at first, but afterwards in the methods and practices of working them, and getting up the various sorts of materials from them, as well as in the modes of preparing, trimming, and arranging them, after they have been raised. They are, however, mostly well known and familiar to the quarry-men and pit-men who are usually engaged in works of the several different kinds.

Quarrying Slates and Stones, the methods of preparing and fitting them for their different uses and applications at the quarries and pits where they have been raised. The former of these articles, particularly those of the blue, green, and purple or blackish kinds, undergo several different sorts of preparation in the quarrying, according to the purposes to which they are to be afterwards applied. They are separated and divided into very thin pieces or slates, where light, neat coverings are required, or in much demand; but for more strong and heavy coverings, in exposed situations, or other places, they are split into much thicker sheets, layers, or slates, and are, of course, more clumsy in their appearance.

Each fort in the bourns of quarrying is wrought in a separate manner, and packed up by itself; the different sorts having appropriate names, as has been already seen.

The white or brown slates are never divided and prepared in fo thin a way as the other kinds, but separated into much thicker leaves or lamins, in this intention. The blue, green, and purple or darkish forts, are, for the most part, found capable of being split into very thin lamins or flockets; but those of the white, or brownish free-flone kinds, can seldom be separated or divided in any very thin manner, as the layers of the large leaves of the flones are of a much thicker nature, they consequently form heavy, strong, thick coverings, proper for buildings in exposed climates and situations, and of the more rough kinds, such as barns, flats, and other forts of out-houses.

In the different operations and proceedes of this fort of quarrying, slate knives, axes, bars, and wedges are chiefly made use of in the different intentions of splitting and cleaning the slates, they being separated into proper thicknesses by the axe, bar, and wedge, and afterwards chipped into their proper forms and shapes by the knife. All the different inequalities which may appear upon any part of them, are likewise removed by this last fort of implement.

In the quarrying of the latter sorts of materials, or of those of flones, the work is usually performed in such a manner as to suit the different uses for which they are intended. Where flags are to be formed, they are split or riven into suitable thicknesses, and squared to different sizes, so as to be adapted to different applications. These operations are executed in rather a rough way, as they are afterwards to be finished by the stone-mason. When for slabs, they have the proper breadth and depths given to them in a fort of squaring manner, being left to be completed as they may be wanted for particular uses and applications. Gate-posts, for the most part, quarried to as to have from about a foot to a foot and a half or more in the square. Trough-flones have the quarrying performed to as to be formed into various proper-sized slates or other forms, in a rough manner, being left in these slates to be afterwards hewn and hollowed out, in the intended parts, by the stone-masons.

Stones for building purposes are usually raised and quarried out roughly into something of the square shape, being left in that slate for the builders, who afterwards fit them so as to suit their own purposes and intentions.

In the quarrying of flones, the quarry-men commonly make use of large hammers, with cutting ends on one side, the other being formed in a plain manner; strong, sharp, crowbars,
bars, and broad, sharp, iron wedges; by which means these matters are, from the constant practice of the men, split and torn into such forms as are wanted with great ease and facility. See Quarried.

Quarring Tools, the different sorts of implements which are employed or made use of in the different works of this kind, as in the raising and preparing the various sorts of materials of this nature. They are principally such as those which have been noticed already, and different descriptions of picks, mattocks, and jammers, or boring implements, for the purpose of blasting the various kinds of stone, and other hard materials. These tools are individually described under their particular heads. See each of them.

Quarries, the small pieces which are broken or chipped off from the different sorts of materials which are found and wrought in quarries, while they are undergoing their different preparations for various uses. These substances, where they are of the hard kind, such as those of the blue and lime-flone, as well as some other sorts, are extremely well calculated for the purpose of forming and repairing roads, as they are nearly, if not quite, in a flate fit for immediate application in this way. Materials of these kinds ought, therefore, where they can be conveniently had, never to be neglected by those who have the care and management of roads, as they will save much expense and trouble, in a great number of instances. See Roads.

Quart, q. d. fourth, in Myths. See Quarte.
Quart is particularly used for a diminutive measure, containing one-fourth, or quarter, of some other measure; which fee.

The English quart is a fourth of a gallon, or two pints; the Roman quart, or quartarius, was the fourth part of their congnis.

The committee appointed for examining the standards of weights and measures, and ascertaining those that shall be used in this kingdom, delivered it as their opinion, in their report to the house of commons, A.D. 1814, that the gallon ought to contain 10 pounds of pure water, or 276.8 cubic inches; that the quart, or fourth part of the gallon, ought to contain 40 ounces of water, or 69.12 cubic inches; and that the pint, or half of the quart, ought to contain 20 ounces of water, or 34.56 cubic inches.

The French, from whom we borrow the word, besides their quart, or pot of two pints, have various other quarts, differing from the whole of which they are quarters; as quart de muid, and quart de bœuflet. See Muid, and Busheil.

Quart of Butter, in Rural Economy, a name given to a lump which contains the quantity of three pounds; and which is a mode of selling it that is peculiar to some districts, it being carried in this flate to the markets.

Quart de Soupir, in Fr., Myfie, is a rell equal to a semi-quarver. By a 4th part of a fourfur is meant an equivalent to a double croche, or two quavers in French; and one crotchet in English. See Time-table, and Value of Notes.

Quarte de Ton, Fr., a quarter of a tone, an interval introduced into the enharmonic genus by Arilloxenus. We have neither ear nor harmonic calculations that can furnish us with the exact interval or ratio of a quarter-tone; and when we consider what nice geometric operations are necessary to settle it on the monochord, we are very apt to suspect that this true quarter-tone never has been nor ever will be produced exactly in tune either vocally or instrumentally. Musicians, however, call the difference between A and B, a quarter-tone, an interval which, though in nature, is annihilated by temperament.

This quarter-tone is pretended to be of two kinds; the enharmonic major, in the ratio of 576 to 625, which is the complement of two minor femitones to a tone major; and the enharmonic minor, in the ratio of 125 to 128, which is the complement of the same two minor femitones to the minor tone. Rouleau.

Quaritan, in Medicine, an ague or intermittent fever, the paroxysms of which recur every third day, leaving two intervening days without fever. This is vulgarly called a third-day ague; but in medical language it is termed quartan, or fourth-day ague, because if we reckon the day on which the disease commences as one, then the second paroxysm is on the fourth day, which again becomes one in relation to the succeeding paroxysms. See Fever, Quartan, and Ague. See also Tertian.

Quartarius, a measure among the ancients, being the fourth part of a sextary, and nearly equal to a quarter of a pint of our wine-measure.

Quartaro, in Commerce, a liquid measure at Venice. The amphora, which is a wine-measure, contains 4 bigoncia; a bigoncia is 4 quartari, 16 fieche, or 256b. Pelo groffo; but a bigoncia of brandy is only 14 fieche, or 56b. Kelly's Un. Cambilt.

Quartation, in Metallurgy, is the separation of silver from gold by means of aqua fortis or nitric acid; which is an operation that has something singular in it.

If silver and gold are mixed together into a mafs, and the gold is not less than one-third part of the mafs in weight, the bell aqua fortis poured upon it is not at all capable of dissolving the silver; but if you add more silver to this mafs, by melting it again in the fire, with such a necessary addition of that metal alone as should bring the gold in the mafs to the proportion of less than one-third of the whole, and suffer it to cool, then aqua fortis poured on it will corrode the silver from it: this is also by so much the more strongly performed, as the quantity of gold is less than in the proportion of one-third of the whole mafs; but experience has taught us, that aqua fortis dissolves silver mixed with gold quickly enough when the gold confluences but one, and the silver three parts of a mixed mafs of them; and in this case, if the solution is not too impetuously performed, the gold usually remains in such a proportion, in the same figure that the whole mafs had before the separation of the silver by this method; so that, in this case, there is no reason to apprehend the gold's being torn into minute particles, and diffipated in some measure; though this can hardly be prevented when the silver exceeds the three-quarter proportion, in regard to the gold in the mafs. The artificers, therefore, always make it their study to observe very exactly this proportion of the gold being one-fourth part of the mixture; and thence it is that the operation itself has been called quartation.

In order to ascertain nearly the proportion of gold and silver in a mafs, the allayers rub this mafs upon a touchstone, so as to leave a mark upon it; and they then make marks upon the stone with some of those needles, called touch-needles, the colour of which they think comes nearest to that of the mafs; by comparing the marks of these needles with the mark of the mafs, they discover nearly the proportion of the gold and silver in the mafs. The mafs of gold and silver to be quartered ought previously to be granulated, by melting it in a crucible, and pouring it into a large vessel full of cold water, while at the same time a rapid circular motion is given to the water by quickly flirring it round with a stick or broom. The vessels generally used for this operation are called parting-glaflies. The aqua fortis must be purified for this purpose, and should be so strong as to be capable of acting sensibly on silver when cold, but not so strong as to act violently. If it be very strong, and the vessels
well cloved, a small quantity of the gold will be dissolved along with the silver, which is to be guarded against. Little heat ought to be applied at the beginning, the liquor being apt to swell and rise over the vessel; but when the acid is nearly saturated, the heat may be safely increased. When the solution ceases, which may be known by the discontinuance of the effervescence, or effusion of air-bubbles, the liquor is to be poured off. If any grains appear entire, more aqua fortis must be added, that all the silver may be dissolved. If the operation has been performed slowly, the remaining gold will have all the form of distinct masses, which are to receive solidity and colour by putting them into a taff under a muffle, and making them red-hot. If the operation has been performed hastily, the gold will have the appearance of a black mud or powder, which after five or six washings with pure water, must be melted. The silver is usually recovered by precipitating it from the aqua fortis by means of copper vessels, into which the liquor is poured, or of plates of copper, which are thrown along with the liquor into glafs vessels.

A considerable heat is required to accelerate this precipitation. Dr. Lewis observes, that when the aqua fortis has been perfectly saturated with silver, no precipitation is occasioned by plates of copper, till a drop or two of aqua fortis is added to the liquor, and then the precipitation begins, and continues as usual. The precipitated silver must be well washed in boiling water, and fused with some nitre, the use of which is to scoriify any cuprous particles which may adhere to the silver.

Here we may add, that silver and gold may be parted from one another by the vitriolic acid, as effectually, though not so commodiously, as by the nitrous. If the compound be reduced into grains or thin plates, and boiled in about twice its weight of oil of vitriol to dryness, the silver will be so far corroded, as to be eaily washed off by a little more of the acid; or if the mafs, after the corrosion, be melted in a crucible, the gold will separate and subside, the silver forming a scoria above it. Gold may be purified in the same manner from several other metallic bodies. M. Scheffer says, that this is the most direct way of separating tin from gold.

Lewis's Com. Phil. Techn. 95. 149, &c. See ALCHEMY, DEPART, and GOLD.

QUARTEAU, in Commerce, a wine measure in some parts of France: thus, at Blois, 3-74 quarteaus are equal to 100 English gallons, and each of them contains 6183 cubic inches; in Burgundy, 3-68 quarteaus are equal to 100 English gallons, and each contains 6275 cubic inches. Kelly's Un. Carn.

QUARTE, Fr., Quarta, Ital., the 4th in music, and the third consonance in point of perfection, according to the order in which concords are generated.

The 4th is a perfect concord; its ratio is 3 to 4. It is composed of three diatonic degrees, formed of four sounds; whence it has its name of fourth. Its interval is composed of two tones and a half: a tone major, a tone minor, and a major semitone.

The 4th may be altered two several ways: 1st, by diminishing its interval a semitone, and then it is called the diminished, or false 4th; 2dly, by augmenting it a semitone, and then it is called a tritonus, or superfluous 4th. (See Tritonus.) But the diminished 4th is never used in harmony, and only touched now and then in melody as an appoggiatura, or note of refinement.

The 4th in thorough-bass is accompanied by the 5, and called by some the chord of the 11th.

Another chord is called the superfluous 4th, or tritonus, by the French; which is what we call the chord of the 7, or the, in which the discord is in the base; but it is not the chord of the tritonus, unless the 4th is sharp. See CHORD, and ACCOMPANIMENT.

The succession of two perfect 4ths is allowed in composition, even in similiar manner, provided they are accompanied by the 6th; but these are passages that must not be abused, or pushed too far, as they are not authorized by the fundamental base. The Italians call a regular succession of chords of the 6th false bordons; for which see FOURTH.

QUARTEAU, in Commerce, a meausre for train-oil at Hamburgh: it contains 2 tonnes, or 64 fluggins, and is reckoned at 2 centners, or 224 lbs. net weight. Kelly.

QUARTELOIS, CARTELLOIS, or Cartelois, furtuits, or upper garments, with coats of arms quartered on them, worn by the ancient knights in their military expeditions.

QUARTER, the fourth part of a whole, or integer divided into four equal portions.

In working of fractions, the quarter is expressed by \( \frac{1}{4} \); three quarters by \( \frac{3}{4} \).

Quarter, as a Weight, is a quarter part of the quintal, or hundred-weight.

The quarter is 28 pounds avoirdupois.

Quarter is also a dry measure, containing of corn eight bushels flriked, or two sacks, being that by which corn is generally sold in the London market, and in large quantities in some districts of the country; and the quarter of coals is the fourth part of a chaldron, called a vat.

"Quartermium fraguient ex octo bifullis."

Fleta, lib. it. This seems to have signified originally the fourth part of a ton in weight, or capacity. See Weight.

Quarter, in Althenomy, the fourth part of the moon's period, or lunation, which is divided into four flages, or quarters; containing each from seven to eight days.

The first quarter is from the new moon to the quadrature; the second thence to the full moon. &c.

Quarter, in Heraldry, is sometimes used for an escutcheon, or coat of arms.

In this sense there are sixteen quarters required to prove nobility, in companies, or orders, where none but nobles are admitted.

The word quarters, required as a proof of nobility, is derived hence, that they used anciently to put the coats of arms of the father, mother, grandfather, and grandmother, on the four corners of the tomb of the deceased.

In Flanders and Germany we frequently see tombs that have eight, sixteen, and even thirty-two quarters.

Quarter is also applied to the parts or members of the first division of a coat that is quartered, or divided into four quarters. See Quartering.

The king of Great Britain, in the first quarter, bears gules three lions palleant or, &c. In the second quarter he bears azure three fleurs-de-lis, &c.

Quarter, French, is a quarter fingle, or alone; which is to poetise one-fourth part of the field.

This makes one of the honourable ordinaries of a coat. See Ordinary.

Quarter, in Lasso, Quarterium Anni, is the fourth part of a year.

Hence the days on which those quarters flatedly commence, are called quarter-days.

Quarter-days are the 25th of March, called Lady-day; the 24th of June, called Midsummer-day; the 29th of September, called Michaelmas-day; and the 25th of December, or Christmas-day. Quarter, Fr., in old counterpoint, was proceeding in diftance by a succession of 4ths; which was called, in bar-
barous Latin, *diaet [[]]aronare*; of which we have instances in the "Micrologus" of Guido.

**Quar['']t, in Navigation.** A quarter of a point, wind, or rhumb, is the fourth part of a cardinal point, wind, or rhumb; or of the distance between two cardinal points, winds, &c.

The quarter contains an arc of 11 degrees 15 minutes.

The quarter is what Wulfius, with regard to the other divisions, calls a secondary point of the second order.

**Quarters of a Ship** is that part of the ship's side which lies towards the stern; or which is comprehended between the aftmost end of the main chains and the sides of the stern, where it is terminated by the quarter-pieces. Although the lines by which the quarter and bow of a ship are determined, with respect to her length, are only imaginary, yet experience appears sufficiently to have ascertained their limits; so that if we were to divide the ship's sides into five equal portions, the names of each space would be readily enough expressed. Thus the first, from the stern, would be the quarter; the second, abaft the midships; the third, the midships; the fourth, before the midships; and the fifth, the bow. Falconer.

**Quar['']t, in the Sea Language, may be defined an** arc of the horizon, contained between the line prolonged from the ship's stern and any distant object, as land, ships, &c. Thus if the ship's keel lies on an east and west line, the stern being wellward, any distant object, perceived in the north-west or south-west, is said to be on the larboard or starboard quarter.

Quarter is also used for a canton, or division of a city; consisting of several ranges of buildings, &c., separated from some other quarter by a river, a great street, or by some other boundary.

Such are the twenty quarters of the city of Paris. Ancient Rome was divided several times, under its several augmentations, into quarters, which were called *regions*; as may be observed in the topographies of Aurelius Vitior, Onuphrius Pauvinus, Marliyan, Pyro Ligorio, Boffard, and other antiquaries.

In many cities there are commissaries of the quarter appointed to look to the policy of them. The prior of the Caporions accounts himself the chief and colonel of the fourteen regions, or quarters, of Rome. Mufcari, p. 134.

**Quarters, Franchise of.** See Franchise.

**Quarter, in War,** the place allotted to certain forces to live, lodge, and encamp upon, during a siege, or the like. See Camp.

The general's quarter, called the head-quarters of an army, is that where the general lodges and encamps in person. They used to make lines of communication, to join the several quarters together.

**Quarter at a Siege,** are the encampments on the principal passes about a place; serving to stop the avenues, and to prevent relief and convoy.

Quarter is also used for any lodging made in the field, or champaign, out of a siege. Thus they say, the general has extended his quarters a good way; the enemy coming by, made him contract his quarters.

**Quarters, Intrenched,** denote a place fortified with a ditch and parapet, to secure a body of troops.

**Quarters, Winter,** the place allotted to the troops to pass the winter season in. Wherein these differ from garrisons, see Garrison.

Winter-quarters, when cold or moist, are productive of inflammatory disorders, particularly hard coughs, with inflammations of the pleura or lungs. See Barracks.

**Quarters, Winter,** are also used for the time the troops continue in this lodging; and for the advantage the captains make of it.

In Spain they have also summer quarters.

**Quarter of Assembly,** is the place of rendezvous, where the troops are to meet and draw up, to march in a body.

**Quarters of Refreshment,** denote some well provided, fertile spots, to which troops, that have been much fatigued and harass'd, are sent to recover their strength, or health; even during the season of the campaign.

There are also quarters assigned for the bucklers, and their equipage.

**Quarter also denotes the safety and good treatment promised to persons or troops that surrender, and lay down their arms. Thus we say, the enemy begged quarter.** The phrase took its rise from an agreement anciently made between the Dutch and Spaniards, that the ransom of an officer, or soldier, should be a quarter of his pay. Hence, to beg quarter was to offer a quarter of their pay for their safety; and to refuse quarter was not to accept of that composition for their ransom.

On an enemy's submitting, and delivering up his arms, the victor cannot with justice take away his life. In a battle, quarter is to be given to those who lay down their arms; and at a siege, a garrison offering to capitulate are never to be refused their lives. If sometimes, however, in the heat of action, the soldier refuses to give quarter, it is always contrary to the inclination of the officers, who eagerly interpose for saving the lives of such enemies as have laid down their arms. Nevertheless, there is one case, in which life may be denied to an enemy who surrenders, and also capitulation refused to a place. This is when the enemy has been guilty of some enormous breach of the law of nations, and particularly if it be at the same time a violation of the laws of war. This denial of quarter is no natural consequence of the war, but the punishment of his crime; a punishment which the injured party has a right to inflict: but that the punishment may be just, it must fall on the guilty. When the war is with a savage nation, which observes no rules, and never gives quarter, it may be chastised in the persons of any that are feized or taken, among the guilty; so that by this rigour they may be brought to conform to the laws of humanity. But wherever severity is not absolutely necessary, clemency is to be used. Corinth was utterly destroyed, for having violated the law of nations towards the Roman ambassadors. However, that severity has been censured by Cicero, and other great men. He who has even the most just cause to punish a foreigner as his enemy, will always incur the reproach of cruelty, if he should cause the punishment to fall on the innocent people. There are other methodsable to the sovereign; as the depriving him of some of his rights, taking from him towns and provinces. The evil which a whole nation suffers is the participation inevitable to the members of a political society. The learned Vattel expresses this sentiment, that in a knowing age, it could be conceived that it is lawful to punish with death a governor who has defended his place to the last extremity; or who, in a weak place, has professed to make a stand against a royal army. Yet, even in the 17th century, this notion was so common as to make an article in the law of war; and, at a later period, it is not wholly exploded. What a thought! to punish a brave man for having performed his duty. Very different were the principles of Alexander the Great, when he gave orders for sparing some Mileans, "on account of their courage and fidelity." It is in vain to object, that an obsequious defence, especially in a weak place, against a royal army, only causes a great effusion of blood to no purpose; for this defence may save the state, by delaying the enemy some days longer; and
and, besides, courage supplies the want of fortifications. It is urged farther, that by threatening a commander with death, you may shorten the bloody siege, spare your troops, and gain a valuable opportunity. The answer is, says Vattel, that a brave man will defile your menace, or, provoked at such ignominious usage, will fell his life at a dear rate, make you pay for your injustice, and bury himself under the ruins of his fort. Besides, the menace of an unjust punishment is unjust in itself; it is an insult and an injury. But to execute it, would be barbarous and horrid; and if it is not to take effect, it must be allowed to be vain and ridiculous. Nevertheless, just and lawful means may be used for inducing a governor not obstinately to reduce himself to the last extremity; and this is at present done by all wise and humane generals. A governor is summoned to surrender, and in the progress of the siege an honourable and advantageous capitulation is offered him, with an intimation that if he stays too long, he will be admitted only to surrender as a prisioner of war, and at difcretion: if he perfils, and is at length forced to surrender at discretion, all the severity of the law of war may be used, both against him and his troops. But this right never extends so far as to deprive an enemy of life, who lays down his arms, unless he has been guilty of some proportionate crime towards the conqueror. See Capitulation, Prisoners of War, and Reprisals.

Quarters, in Building, those flight, upright pieces of timber, placed between the pannels and posts; used to last upon. They are of two kinds, single and double. The single quarters are fawn to two inches thick, and four inches broad; the double are four inches square.

Quarters in a clock, are little bells, which found the quarters of an hour.

Quarters, in Sea Language, the several stations of a ship's crew in the time of action. See Quartering the Men.

Quarters, in the Mange, to work from quarter to quarter, is to ride a horse three times upon the first of the four lines of a square; then changing your hand, to ride him three times upon the second; and so to the third and fourth, always changing hands and observing the same order.

Quarters of a Saddle, the parts or pieces of leather, or fluff, which are made fast to the lower part of the sides, and which hang down below the saddle.

Quarters of a Horse, and other Animals, the four principal parts of the animals; the fore-quarters confilt of the shoulders and the fore-legs; the hind-quarters, of the hips and the hind legs.

In the horse, the fore-quarters or shoulders should always fall in a neat manner backwards, where they join with the breast, and the hind-quarters be suitably long and well shaped towards the rump. Something of a similarity of shape should likewise prevail in the quarters of neat cattle, sheep, and swine, but they should be much more flexy downwards as they approach the thigh and leg parts. See Live-Stock, Horse, Sheep, and Swine.

Quarters of the Foot, in horses, are the sides of the coffin, comprehended between the toe and the heel on both sides; the inner quarters are those opposite to one another, facing from one foot to the other; they are always weaker than the outside quarters, which lie on the external sides of the coffin. A horse is said to have a false quarter, when the hoof has a kind of cleft occasioned by the cafting the quarter and getting a new one, for then the horn becomes uneven, and also lofter than the rest of the hoof; and the foot should be thod with some nicety. But if the cleft be considerable, and take up a fourth of the hoof, the horse is worth little afterwards for any purpose.

Quarter-Calf, among horses, is when for any difease in the coffin-bone or joint, one of the quarters of the hoof is call’d off, and when thus call’d, the reproduction of a new hoof or part takes place. It is a common occurrence among some horses.

Quarter-Evil, among domestic animals of the neat cattle kinds, is an affection which sometimes takes place in the glands of the udders, and sometimes in different parts of the feet.

Quarters, in Gardening, the large divisions of garden grounds, or those parts of them which are situated between the different walks, at a distance from the small, narrow portions on the sides usually termed borders, and which form or constitute the principal spaces or compartments for the cultivation and growth of the various sorts of the more useful culinary vegetables which are raised in large quantities; such as peas, beans, cabbages, cauliflowers, broccoli, early potatoes, and many others.

It is neccesary to have the quarters of garden grounds formed and laid out in such a manner as to favour the growth of early and late crops of the several different sorts, as much as possible; those for the former having a southern, or south-western exposure, and those for the latter, an eastern, or north-eastern aspect. By these means, early crops are, in some measure, rendered more forward and fine, and those of the more late kinds, in some degree, prevented from being injured or burnt up and destroyed by too full an exposure to the heat of the sun.

It is usual during the winter season to have the large quarters of garden grounds laid up in high ridges, in order to be exposed to the influence and effects of frosts, by which the earth may be rendered more light and mellow, and be in a more fit state for sowing or planting in the spring months, on throwing them down and rendering them level for the purpose.

The large quarters of gardens should likewise be kept as free and open as possible, not being inclosed and choked up, as is too frequently the case by planting fruit-trees and shrubs on their sides, either in the manner of edificers or otherways, as by such means the growths of the plants are much promoted, and they are prevented from being drawn up in a weak manner. See Garden.

All forms of garden grounds are found, except that of the square, to delange the regularity of the quarters, and, of course, to render them highly troublesome in digging and cropping. Where they are very large they may be subdivided into suitable sites, as one hundred feet in breadth, &c.; but the length being longer does not signify, as it may be varied in different ways, as by rows of trees, bushes, or which, in many cases, are preferable, by trodden walks and the modes of cropping.

Quarters of a Garden, the several divisions in which it is formed for the purpose of cultivating the different kinds of vegetables, fruits, &c. Thus, there are parts or quarters devoted to the growth of kitchen vegetables, fruit, and other trees, forcing, &c.

Quarters of a Field, or Farm, in Agriculture, are the particular parts of them, which are under, set apart, or intended for any fort of crops, or peculiar modes of cultivation and management. Farmers are frequently in the practice of dividing their lands or farms into different quarters or parts, according to the different sorts of husbandry which they are proper for, and the manner and succession in which the various kinds of crops are to be raised upon them, and the same is often the case with large fields; four, five, fix, and more divisions or quarters, being common in such

influences.
inferences. This plan of proceeding is supposed to give ease, facility, and dispatch, to the work which is afterwards carried on, as well as to have several other advantages and conveniences. See Farm.

Quarter-Bill, in Sea Language, a roll or list, containing the different stations, to which all the officers and crew of the ship are quartered, in the time of battle, and the names of all the persons appointed to those stations.

Quarter-Bullet, a bullet quartered into four, or eight parts.

Quarter-Chord, in Mining, seven yards and a quarter, which the miner hath crofs-ways of his vein on either side, for liberty to lay his earth, stones, and rubbish on, and to wash and drefs up his ore.

Quarters, Clof, in a Ship. See Close-Quarters.

Quarter-Clothes, are long pieces of painted canvas extended on the outside of the quarter-netting from the upper part of the gallery to the gang-way. They are generally decorated with martial instruments, or allegorical figures.

Quarter-Day. See Quarter.

Quarter-Deck of a ship, is that aloft the fleerage, reaching to the round-house; or that deck in ships of war which extends from the main-mast to the stern, next above the upper-deck.

Quarter, flat, in a Ship, denotes the fame with broad. Thus, if the truing in, or tack of a ship's quarter under water be deep, they lay, the hath a fat quarter.

Quarter-Gallery, a fort of small balcony, with or without ballustrades, on the quarter of a ship; which generally communicates with the gallery on the stern, by means of a door passing from one to the other.

Quarter-Guard. See Guard.

Quarter-Gunner, is an inferior officer under the direction of the gunner of a ship of war, whom he is to assist in every branch of his duty; as keeping the guns and their carriages in proper order, and duly furnished with whatever is necessary; filling the powder into cartridges; loading the guns, and keeping them always in a condition ready for service. The number of quarter-gunners in any ship is always in proportion to the number of her artillery; one quarter-gunner being allowed to every four cannon.

Quarter-Netting, is a fort of net-work, extended along the rails on the upper part of a ship's quarter. In a ship of war these are always double, being supported by iron cranes, placed at proper distances. The interval is sometimes filled with cork or old sails, but chiefly with the hammocks of the sailors, so as to form a parapet to prevent the execution of the enemy's small arms in an engagement.

Quarter-Pieces, subfiantial pieces of timber, mostly of fir, that form the outboard of the stern, and connect the quarter-gallery to the stern and tofhead.

Quarter-Point of the Compass. See Point.

Quarter-Rails, in a Ship, are narrow-moulded planks, generally of fir, reaching from the top of the stern to the gang-way. They are supported by f shakes, and serve as a fence to the quarter-deck, to prevent the men from tumbling into the sea by the rolling of the ship, particularly in small vessels.

Quarter-Round, in Architecture, is a term used by the workmen for any projecting moulding in general, whose contour is a perfect quadrant, or quarter of a circle; or which approaches near that figure. The architects usually call it ovolo; and Vitruvius, the echinus.

Quarter-Staff, a long staff, or pole, borne by forefathers, park-keepers, &c. as a badge of their office; and occasionally used as a weapon.

Quarter-Wheeling, or Quarter of Concentric, in the Military Art, is the motion by which the front of a body of men is turned round to where the flank was; this making the quarter of a circle.

If it be done to the right, the man in the right-hand angle keeps his ground, and faces about, while the left wheel; if to the left, the left-hand man keeps his place, &c.

Quarter-Wind, at Sea, is a lateral, or side-wind; or a wind which does not blow in stern, but a little aside of it.

Properly, the quarter-wind is that which comes in abash the main-mast throuds, even with the quarter of the ship.
The quarter-wind is the belt of all winds, as bearing into all the sails; whereas a wind blowing full in stern, is kept off by the fails of the mizen.

Quartermates, in Commerce, a corn-measure in Spain, containing 12 cartones; the falma contains 4 quarteras, or 48 cartones; the carga, 2½ quarteras, or 50 cartones; 78⅔ quarteras correspond to 100 Castilian faugas; and 100 quarteras Catalan to 128 Castilian faugas; 39 quarteras Catalan contain 10 English quarters. The cargo of wine and brandy is divided into 16 cartones, 32 quarteras, or 128 quartillos.

At Barcelona 39-08 quarteras are equal to 10 English quarters, and a single quenora contains 4401 cubic inches. Kelly's Un. Cambii.

QUARERED, Counter. See Counter-quartered.

QUARTERIDGE, money paid quarterly, or by the quarter.

QUARTERING of Soldiers, in Military Language, seems to have ancantly differed very little from that now in use, except that they were indiscriminately quartered upon all householders, as was practised in England to late as in the rebellion of the year 1745. Rapin says, that William the Conqueror quartered almost all his troops upon the monasteries, and obliged the monks to furnish them with necessaries; by which means he maintained his army without any charge, and had spies in all their religious houses, who watched the actions of the monks; these houses were long after charged with finding carts and horses for the carrying the baggage of the army; and there are full extant many of the original returns from different monasteries, stating the number of each they were able to furnish for that purpose. About the time of Henry VII. we meet with a regulation that bears some reference to quarters; this is a coat and conduct-money; the first was a species of clothing, probably, for recruits; the money for which was advanced by the county in which they were raised;—conduct-money was an allowance for subsistence, to and from the army, according to the number of days which the soldiers had to march; a day's march being estimated some times at 12 and sometimes at 15 miles. Both the coat and conduct-money were occasionally advanced by the different counties in which the troops were quartered, under the promise of being repaid by government. Towards the latter end of the reign of James II. and even after the accession of King William III. soldiers used to oblige the inhabitants of the towns in which they were quartered, not only to furnish them with diet and lodging, but also to advance them their daily subsistence. After the revolution, by the mutiny-act, passed the 23rd day of December, in the year 1689, other laws and regulations respecting quarters were enacted.

By the petition of right in the third of Charles I. it is enacted and declared, that the people of the land are not by the laws to be burdened with the fojournings of
of soldiers against their wills; it is also enacted by the 31 Car. II. c. 1. that no officer, military or civil, nor any other person whatsoever, shall presume to place, quarter, or billet any soldier on any subject or inhabitant of this realm, of any degree, quality, or profession whatsoever, without his consent; and every such subject or inhabitant may refuse to fowrump or quarter any soldier, notwithstanding any command, order, warrant, or billeting whatsoever. The present mode of quartering our troops is settled by the Mutiny Act, renewed annually, with little or no alteration. Accordingly by the mutiny act, 49 Geo. III. c. 12. §. 41. the constables and other chief officers and magistrates of cities, towns, villages, and other places, and in their default or absence, any one justice inhabiting in or near such place, and no other, shall and may, during the continuance of this act, quarter and billet officers and soldiers in inns, livery stables, alehouses, victualling houses, and the houses of fellers of wine by retail to be drank in their own houses or places thereunto belonging, (other than persons' cellars held under the authority of the commissioners for the affairs of barracks, and other than persons who keep taverns only, being free of the vintners' company in London,) and all houses of persons selling brandy, strong waters, cyder, or mead, by retail to be drank in houses, (other than the house of distillers who keep places of distilling brandy and strong waters, and of shopkeepers whose principal dealings shall be more in other goods than in brandy and strong waters, and who do not permit toelling in their houses,) and no other, and in no private houses whatsoever; nor shall any more billets be ordered than there are effective soldiers; which billets when made out shall be delivered to the commanding officer prefent: and if any constable, or such like officer or magistrate as aforesaid, shall presume to billet any such officer or soldier in any private house without the consent of the owner or occupier, such owner or occupier shall have his remedy at law against such magistrate or officer, for damages; and if any military officer shall take upon him to quarter soldiers otherwise than by this act, or shall offer any menace or compulsion to any mayor, or other civil officer before-mentioned, tending to discourage any of them from doing their duty, he shall on conviction before any two justices by the oath of two witnesses be ipso jure caffed: and if a civil officer, he shall forfeit to the party grieved 20s. on proof thereof to the next justice by ditrefs.

By f. 53. Officers and soldiers, billeted as aforesaid, shall be received and furnished with diet and small beer, paying for the same as hereafter mentioned, out of their subsistence-money.

By f. 54. If any person shall choose rather to furnish non-commissioned officers or private men, with candles, vinegar, and salt, greed, and allow them the use of fire and the necessary utensils for dressing and eating their meat, and shall give notice thereof to the commanding officer, and shall furnish the same accordingly; in such case they shall provide for their own victuals and small beer, and the officer who receives their pay shall pay the sums after mentioned out of the subsistence-money for diet and small beer to them, and not to the persons on whom they are quartered.

By f. 55. Every officer receiving the pay or subsistence-money, either for a regiment, or particular troops and companies, or otherwise, shall immediately, upon receipt of each sump, give public notice thereof to all on whom officers or soldiers are quartered; and shall also appoint such persons to repair to their quarters, at such times as they shall appoint, for the payment of the said pay or subsistence-money to the officers or soldiers, which shall be within four days at the farthest after the receipt of the same, as aforesaid; and such persons shall then and there acquaint such officer with the accounts or debts between them and the officers and soldiers quartered; which accounts the said officer is to accept of, and immediately pay the same, before any part of the pay or subsistence be distributed; provided the said accounts exceed not, for a commission officer of horse being under the degree of a captain, for such officer's diet and small beer, per diem, 2s.; nor for one commission officer of dragons, being under the degree of a captain, for such officer's diet and small beer, per diem, 1s.; nor for one commission officer of foot, under the degree of a captain, for such officer's diet and small beer, per diem, 6d.; nor for one light horseman's diet and small beer, per diem, 7d.; and hay and straw for his horse, per diem, 6d.; nor for one dragon's diet and small beer, per diem, 7d.; and hay and straw for his horse, per diem, 6d.; nor for one foot soldier's diet and small beer, per diem, 6d.; and if such officer shall not give notice and shall not immediately upon producing such account filet satisfice the same; upon complaint on oath by two witneses, at the next quarter sessions for the county or city where such quarters were, the paymaster of the guards, garrisons, and marines, are authorized (upon certificate of the said justices before whom such oath was made) to take up such accounts and the per-
fons to whom the fame is owing) to pay the said sums out of the arrears due to the said officer, upon pain of such paymaster forfeiting his place, and being incapacitated from holding it again. The act then states what course is to be pursued if there be no arrears due, or no subsistence-money remitted, and is directory of the course to be pursued by the paymaster.

By f. 49. The commanding officer may exchange any men or horses quartered in any place with another man or horse quartered in the same place, provided the number of men and horses do not exceed the number at that time billeted on such house.

By f. 47. And where any horse or dragoon shall be quartered upon any person who hath no stables, upon his complaint to two justices of the division, &c. and his making such allowance as such justices shall think reasonable, they may order the men and their horses, or the horses only, as the case may be, to be removed and quartered upon some other person who hath stables, and may order and settle a proper allowance to be made by the person having no stables, in lieu of his quartering such horse or dragoons, and order payment thereof to the person to whom the removal is made, for or to be applied for the furnishing of quarters for such men and their horses.

By 49 Geo. III. c. 37. It is enacted that every non-commisioned officer and private soldier who shall be furnished with diet and small beer by the perons on whom they are quartered, shall pay for the same 1s. 4d. per day, in like manner as the late act is enacted as to the 7d. per day.

By f. 2. Where the inholder, &c. furnishes certain articles in lieu of diet and small beer, as in the former act mentioned, he shall have one halfpenny per day for each non-commisioned officer, &c.

By f. 3. 1s. 3d. per day is to be paid for each horfe, instead of 6d. per day.

By f. 4. The provisions in the former act relating to the dieting on a march or recruiting are repealed.

By f. 5. All non-commisioned officers and soldiers shall receive their diet and small beer at the above rates while on the march and on the day of arrival at the place of their final destination, and on the two subsequent days, unless either of the two be a market day for the place where billeted, or within two miles thereof; in which case the innkeeper, &c. shall discontinue on and from such market-day the diet and small beer, and furnish in lieu thereof the articles in the said former act specified, and at the rate in this act prescribed.

By f. 6. If any person liable to have soldiers quartered on him shall pay any sum to any non-commisioned officer or soldier on the march in lieu of the diet and small beer, he may be proceeded against and fined as if he had refused to furnish according to the former act the things to be furnished to non-commisioned officers and soldiers so quartered as aforesaid.

By f. 7. The provisions of f. 5. are extended to halting on a march.

By f. 8. But if the halt be for longer than one day, and the day after the arrival be market-day as aforesaid, there is to be no discontiuance of diet and small beer.

By f. 9. Non-commisioned officers and private men employed in recruiting, and the recruits by them raised, shall, while on the march, and for two days after the day of their arrival at any recruiting station, be entitled to the same benefits as before provided for troops on the march; but no recruit enlisted after the two days subsequent to the arrival of the party at their recruiting station, shall be entitled to be supplied with diet and small beer at the rate herein-before preferred, except at the option of the party where quartered.

Provided that in case any recruiting party, with the recruits by them raised, shall remove from their station, and after a time shall return to the same place, they and the recruits shall not be again entitled to the diet and small beer for two days, unless the time of absence exceed 20 days. This act to continue to 25th March 1810.

By f. 52. Any justice within his county, &c. may command any constable or other officer who shall billet any soldiers, to give an account in writing to him of the number of officers and soldiers billeted by them, and the names of the persons on whom quartered, and an account of the place where they dwell, and of their signs, if any. See Martial Law, and Soldiers.

But by the 50 G. III. c. 96. f. 1. it is enacted, that after the 25th of June 1810, every non-commisioned officer and private soldier who shall be furnished with diet and small beer within the parts of the united kingdom mentioned in the 50 G. III. c. 28. by the inholders or other persons on whom such non-commisioned officers or private soldiers shall be quartered and billeted by virtue of the said act, shall pay and allow for the same, the sum of eight-pence per diem in the stead of one shilling and four-pence per diem, as in the said act specified; and that for such allowance of eight-pence, the innkeeper or other person shall furnish one meal; a dinner, &c. at any dinner if required in each day to each non-commisioned officer, trumpeter, drummer, and private soldier quartered and billeted on him, to consist of such quantities of diet and small beer as shall be specified and fixed in and by any regulations made or to be made from time to time by his majesty in that behalf, but not to exceed one pound and a quarter of meal previous to being dressed, one pound of bread, one pound of potatoes or other vegetables previous to being cooked, and two pints of small beer, and vinegar, salt, and pepper.

And by f. 2. of the same act, the mutiny act, and the said 50 G. III. c. 28. shall be applied for the enforcing such regulations as to the diet of soldiers and the payment of and accounting for the allowances for the same.

Quartering of Traitors, in Law. See Treason.

Quartering, in the Sea Language. When a ship under sail goes at large, neither by a wind nor before a wind, but, as it were, betwixt both, she is said to go quartering.

The term is also used when a ship fails with quarter-winds.

Quartering the Men, the disposing of the ship's company at the time of an engagement in such a manner, that each may readily know where his station is, and what he is to do: as, to come to the matter, for the management of the falls; to come to the gunners to traverse the ordnance; to come for providing the enemy with small shot; to come to fill powder in the powder-room; others to carry it from thence to the gunners in cartridggs, &c.

The number of men appointed to manage the ordnance is always in proportion to the nature of the guns, and the number and condition of the ship's crew. They are in general as follow, when the ship is well manned, so as to fight both sides at once occasionally:

<table>
<thead>
<tr>
<th>To a 42-pounder</th>
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<th>15 men.</th>
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This
This number, to which is often added a boy to bring powder to every gun, may be occasionally reduced, and the guns ne\text{vertheless well managed.}

The number of men appointed to the small arms, on board his majesty's ships and floops of war by order of the admiralty, are,

<table>
<thead>
<tr>
<th>Rate of the Ship</th>
<th>Number of Men</th>
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<td>1d</td>
<td>150</td>
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<td>2d</td>
<td>120</td>
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<td>3d of 30 guns</td>
<td>100</td>
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<td>of 70 guns</td>
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<tr>
<td>4th of 60 guns</td>
<td>70</td>
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<td>of 50 guns</td>
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<td>5th</td>
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<td>6th</td>
<td>40</td>
</tr>
<tr>
<td>floops of war</td>
<td>30</td>
</tr>
</tbody>
</table>

The lieutenants are usually stationed to command the different batteries, and direct their efforts against the enemy.

The master superintends the movements of the ship, and whatever relates to the sails. The boatwain and a sufficient number of men are stationed to repair the damaged rigging; and the gunner and carpenter whatever may be found necessary, according to their respective offices. The marines are generally quartered on the poop and forecastle, or gangway, under the direction of their officers: although, on some occasions, they affilt at the great guns, particularly in distant cannonading. Falconer. See Engagement.

Quartering, in Gunnery, is when a piece of ordnance is so traversed, that it will shoot on the same line, or on the same point of the compass, as the ship's quarter bears.

Quartering, in Heraldry, the act of dividing a coat into four or more quarters, or quarterings, by parting, coupign, &c. i.e. by perpendicular and horizontal lines, &c. See Quarter and Quarterly.

The king of Great Britain quarters with Great Britain, France, Ireland, Brunswick, &c.

Colombiere reckons twelve forts of quartering; but other authors give us more—viz. party per pale, dividing the escutcheons from top to bottom. See Pale.—Party per cross, dividing it from side to side. See Cross.—Party of six pieces, when the escutcheon is divided into six parts, or quarters.—Party of ten; of twelve; of sixteen; of twenty; and of thirty-two; when there are so many partitions respectively.

Others give the divisions in another manner: as—Party per cross—per pale—per chief—per pale irclave—per bend dexter—per bend sinister—per chevron—barry bendy of eighty pieces—paleways of six pieces—barry of six pieces—barry of eight pieces—bendy of six pieces—chevy—fully, or lozenge—pale bendy, or bendy lozenge—barry bendy lozenge, or bendy lozenge—gyronny—barry lozenge counterchanged—waved of six pieces—barry nebule of six pieces—party per falkier—and party per pale in point. See farther under their respective articles.

Counter-quartering a coat, is when the quarters are quartered over again, or subdivided each into four. See Counter-quartered.

There are counter-quartered coats which have twenty or twenty-five quarters.

Quartering is also applied to the partitions or compartments themselves, that is, the several coats borne on an escutcheon, or the several divisions made in it, when the arms of several families are to be placed on the same shield, or account of intermarriages, or the like.

Colombiere observes, that thirty-two is the greatest number used in France; but that the English and Germans sometimes extend to forty: as a testimony of the truth of which, he says he saw an escutcheon of the earl of Leicesters, ambassador extraordinary in France in the year 1639, divided into the number of forty: and hence, he affirms, do go on to sixty-four several coats.

But a multitude of quarters make a confusion; and, accordingly, all the writers of armoury exclaim against it as an abuse. The first instance of quartering, of which we have any account, is said to be in the arms of Renatus, king of Sicily, &c. in the year 1435, who quartered the arms of Sicily, Arragon, Jerusalem, &c.

William Wickley observes, that such quarterings are much more proper for a pedegree, to be locked up in a chest, and occasionally produced as an evidence for the clearing or averting of alliances of families, and titles to lands, &c. than to be borne as a cognizance.

In blazoning, when the quartering is performed per cros, the two quarters a-top are numbered the first and second; and those at the bottom the third and fourth; beginning to tell on the right side. When the quartering is by a falkier, &c. the chief and point are the first and second quarters, the right side the third, the left the fourth.

Quartering is sometimes also used for the distinguishing of younger brothers from elder. See Difference.

Quarterization, Quartering, part of the punishment of a traitor, by dividing his body into four quarters.

"Wallingham, in Ric. II. Audittum et confessum turpifima secula tradactiuni, suspendo, decollationem, exenterationem, et quarterizationem adjudicavit."

Quarterly, in Heraldry, a person is said to bear quarterly, when he bears arms quartered.

The king of Great Britain bears quarterly of four; in the first quarter gules, &c. Great Britain; in the second, azure, &c. Ireland, &c.

Quarter-Master, an officer in the army, whose business it is to look after the quarters of the soldiers; their clothing, bread, ammunition, firing, &c. Every regiment of foot and artillery has a quarter-master, and every troop of horse one, who are only warrant-officers, except in the Blues. Whereof there are several kinds; viz. the Quarter-Master General, whose business is to provide good quarters for the whole army.

Quarter-Master of Foot, he who is to provide quarters for a regiment of foot.

Quarter-Master of Horse, he who is to provide quarters for a troop of horse.

Quarter-Master, in a Ship, is an inferior officer, appointed by the master of a ship of war to assist the mates in their several duties; as flowing the ballast and provisos in the hold, coiling the cables on their platforms, looking after the appearance of the ship, and keeping the time by the watch-glasses.

Quatern, Quarteron, a diminutive of quart, signifying a quarter of a pint, as a quart does a quarter of a gallon.

Quar-tier, in Commerce, a liquid measure in Germany, which, according to a regulation of 1713, made in Hanover, must hold 21h. of spring water, and the contents of which are 49 French, or 5¼ English cubic inches. A fuder of wine contains 4 exchefts, 6 ams, or 15 eimers; an aham, 4 ankers, 40 flbugens, 80 kannes, 160 quarters, or 320 nobles. Hence 36 flbugens, or 144 quarters, = 37 English wine gallons. A fas of beer at Lubeck contains 42 flbugens, or 168 quarters. Kelly's Un. Cambit.

Quartile, an aspect of the planets when they are three signs, or 90 degrees distant from each other.
The quartile aspect is marked thus □. See Aspect.
QUARTILLO, in Commerce, a liquid measure in Spain. At Barcelona, 128 quartillos are equal to 32 quarters. (See QUARTER.) A moido of wine contains 16 arrobas; an arroba 8 azumbres, or 2 quartillos. The arroba of wine contains 34 lb. of water (Cañillian weight), and measures 125½ Spanish, or 98 English cubic inches; hence four such arrobas are equal to 17 English wine gallons. The arroba of oil measures 966 Spanish, or 771 English cubic inches; so that these four arrobas correspond to 10 English gallons; this arroba is divided into 4 quartillos, or 100 quarterones, or pinallas. A Spanish bottle contains 30 arrobas of wine, or 38¾ of oil; a pipe is 27 arrobas of wine, or 34½ of oil; thus the bottle is 125½ English gallons, and the pipe = 114½. Kelly. See Tab. XXXII. of Measures.
QUARTO, or 4to, a book whose four leaves, or eight pages, make a sheet.
QUARTO, in Commerce, a money of account in Spain. See REAL.
QUARTO dell Torri, in Geography, a town of Naples, in Capitanata; 12 miles W. of Salpe.
QUARZO, or Quaz, in Law, denotes the fourth day inclusive beyond the return of a writ, in which those that are summoned are allowed to make their appearance. See Easter, day of term.
QUARTH-DECIMANS, QUARTH-DECIMANI, in Ecclesiastical History, an ancient sect in the church, who maintained that Easter was always to be celebrated, conformably to the custom of the Jews, on the fourteenth day of the moon in the month of March, whensoever that day fell out. And hence their name Quarto-decimani, q. d. Fourteen-teenthers.
The Atheists were mightily attached to this opinion, pretending that it was built on the authority of St. John, who was their apostle; and pope Victor could never bring them to obedience in this article, though he was upon the point of excommunicating them: but it is more probable he contended himself with menaces. See Easter.
QUAROVUM par constringens, in Anatomy, a name given by Spigelius and some others to the muscules called by Albinus and Riolanus orbicularis oris; and by Cowper and some others, contrilator labororum.
QUARTUS hyoidis mulfetus, a name given by Vefalius, Fabricius, and many other anatomists, to a muscle now generally called the coracoxyeides.
QUARTUS oculorum movens, a name given by Vefalius to one of the muscles of the eye, called by some rectus inferior, and by others humilis.
It is the depressor oculi of Albinus, being one of the quattuor recti oculi of that author.
QUARTZ, in Mineralogy. No substance in the mineral kingdom is more abundantly distributed than quartz. Grains of quartz generally compose a considerable part of the sands on the sea-shore, and of the sandstones of the secondary strata. Rolled pieces of quartz, or pebbles and boulders, are widely scattered over alluvial districts. Quartz is disseminated through granite, gneis, mica-flate, and other compound rocks which constitute the loftiest mountains on the globe; it also forms veins of vein extend intertinge these mountains, and sometimes entire simple rocks are composed of this mineral. Quartz has a confiderable degree of hardness, always striking fire with fleck, and the fragments have sufficient solidity to resist the blowpipe. Powdered quartz feels harsh, and, when rubbed on polished steel, or on glass, scratches the surface. Quartz is infusible by the common blowpipe. These two qualities, hardness and infusibility, are the essential characters of all the varieties of quartz, whatever forms or colours they may present, whether mafive or crystallized. Quartz has most commonly a conchoidal fracture, but sometimes the fracture is undulatus, foliated, or splinterly. The lustre is vitreous. Quartz has various degrees of transparency; from a perfectly pellucid colourless state, it passes by different gradations to opacity; but all the varieties, except the mafive, admit light through the very minute fragments. The colours are various, owing to the impregnation or intermixture with foreign subftances. The specific gravity of quartz is from 2.58 to 2.65. It yields a phosphor inferent light when rubbed, and is not soluble in any of the acids except the fluoric. According to Vauquelin, powdered quartz gives a green colour to tincture of violets.
Quartzifed quartz presents the phenomenon of double refraction, when an object is seen through one half of the pyramid that terminates the crystals, and the opposite side of the hexagonal prism on which it is placed, in the most common variety of the secondary forms of these crystals.
The substances found imbedded in quartz are, ores of tin, antimony, gold, silver, copper, and lead, arsenic, and micaeous iron ore, with chloride, hornblende, felspar, garnet, and float of lime. It is also penetrated by fibres of aiberius, and by minute laminae of mica and epidote; the latter substance is sometimes fo intimately diffused through quartz as to give it an homogeneous green colour. This variety of quartz is called prase.
Quartz crystallizes distinctly: some of the crystals are of considerable size.
In the imperial cabinet of Vienna, there is said to be a crystal of quartz seven feet in length. The forms of crystal-lline quartz are various; they have been reduced by modern mineralogists to fix or seven principal varieties. The most common is a fix-fid frim, terminated by a fix-fid pyramid, or two fix-fid pyramids joined at their bases. The sides of these pyramids are irregular, having the vertical angle 40°, and each of the angles at the base 70°. The sides of the upper and lower pyramids are inclined to each other at an angle of 104°. According to Haüy, the primitive form of the crystal is a rhomboide, varying little from the cube, the angles being 94° and 86°. The primitive rhomboide is rarely found in nature; it occurs sometimes in red hematite, coated with that mineral, and in chalcedony.
Bubbles containing air, water, and bitumen, are sometimes seen in quartz crystals, and have given rise to much speculation respecting their formation. Silices earth, of which these crystals are composed, is insoluble in water, by artificial means; but in the great laboratory of nature, its solution is effected probably by the effect of heat and compulsion, as ifex exist in the boiling fountains of Iceland and the Azores, and in the hot springs of Bath, Italy, and various parts of the world. It has been supposed that the silicious earth was held in solution by foda; but Klaproth, who analyzed the waters from the Reikum, in Iceland, thanks the quantity of alkali too small to have diffolved the fexe. One hundred cubic inches contained nine grains of fex, three of carbonat of foda, eight of common salt, and five of sulphate of foda. If rock crystals were formed in an aqueous solution greatly heated and compressed, it would not be difficult to conceive how volatile matter might be involved in the substance of the crystal during its formation; but our knowledge of the subterranean operations of nature is at present too limited to enable us to ascertain, or even to form any rational conjecture in what manner some of her more mysterilious processes are effected. Those who have frequent opportunities of exploring mines, will not be disposed to deny that silicious halantites, and crystals, are now forming at the common temperature of the earth, as they are observed.
QUARTZ.

served on the roofs and sides of artificial excavations, and
passages which have been undisturbed for some years. Ac-
cording to Chaptal, a quartzose or a siliceous paste is formed by
transfusion on ferruginous rocks at Chamillat, near Planches
les Mines, in Franche Comté, and where this is washed and
deposited by water, rock crystals are formed. Siliceous
flakes do not unfrequently been seen coating the wood
which has been left in mines.

Pleneigrunorphous crystals of quartz, or falso crystals of
this mineral, are frequently found in mines; they are tar-
nified and opaque, and their edges are blunted. They
assume the forms of cubic crystals of floor, and the pyra-
midal and other forms of calcareous and other crystals.
These false crystals are evidently moulded in the cavities
which the former have once occupied. Quartz also occurs
filling up the cavities of shells in a similar manner, and the
pores of wood and other organic substances.

Cellular quartz with polyhedral cavities, appears to have
been formed round crystals of other minerals which are sub-
sequently decomposed. The internal crystals are frequently
those of the metallic sulphurites. Brongniart fays
this conclusion is founded on direct observation, as the re-
 mains found in these cavities are sulphur, native gold, and
oxvd of iron, all sulphurites which originally formed part of
the decomposed sulphurites. Such is the cellular quartz at
Schemnitz in Hungary, and Joachimsthal in Bohemia. The
cellular quartz at Berezof, in Siberia, is fo porous that it is
lighter than pumice.

Rock crystal, or Mountain crystal, is the purest variety
of quartz, differing from common quartz by its transparency,
and the more regular form of its crystals; the fracture is
also more perfectly conchoideal. According to some analyses,
rock crystal contains 98 parts of silex, with 2 parts of
water. Bergman found in one specimen only

| Silex | 93 |
| Alumine | 6 |
| Lime | 1 |

Amethyst is a purple variety of rock crystal. See Am-
ethyst.

Caingeronum flones are rock crystals, from the mountains
of Caingeron, in Scotland. They are valued by jewellers
on account of their purity and colour. Close-brown quartz
are known by the name of the smoke topaz. Accord-
ning to Karlfen, the specific gravity of this variety is
2.88. Coloured rock crystals lose their colour, when care-
fully exposed to a gentle heat, but retain their transparency.
The yellow and orange-yellow varieties are the most
esteemed.

Milk quartz, called by some mineralogists roce quartz,
and by others the Bohemian ruby, as it is frequently of a
beautiful roce-red colour, which it derives from manganese.
By exposure to the light the intensity of its colour is dimi-
nished. It is used in jewellery, and takes a good polish; it
is sometimes sold for the ruby, but is less hard, nor has it
the transparency and brilliancy of that gem. Rose quartz
is found at Rabenflein, in Bavaria, in considerable masses,
and in a vein of manganese which traverses a coarse-grained
granite. It occurs also in Sweden, Greenland, Saxony, in
the island of Coll, one of the Hebrides, and in Ireland.
Some varieties are of a milky-white colour, others pearl-grey.

Iridescent quartz, Quarz byalin irifs, presents on its sur-
face, or in its interior, the various colours of the rainbow:
if sometimes derives this property from a thin pellicle of me-
tallie oxd which covers the surface, and sometimes from
minute fissures in the substance of the crystal. These colours
may be given to quartz by heating it and exposing it fud-
deny to a cold temperature.

Avanturine quartz (fee Avanturine) owes its brilliancy
to minute particles of mica diffeminated through it, and
sometimes to minute fractures. Avanturines may be formed
artificially, in some varieties of quartz, by heat.

Blue quartz, Quarz byalin saphirin, has been found in
Spain, Bohemia, and Bavaria.

Black quartz is found, mixed with carbonate of lime, in
the department of Ière in France, in Bohemia, and at
Coppé Nuova, on the road to Sienna. Brongniart Mi-
neralogy.

Cat's-eye, Quarz byalin chatoyant, so called because it re-
reflects a pretty variety of colours, according as the light falls
upon it in different directions; this property is owing to the
fibrous texture of this mineral, which may be observed in the
different characterised specimens. It contains 95 parts of
silex, and according to Brongniart is a variety of quartz,
and ought not to be classed with silex. The geologicalitu-
flon of this stone is not known. The cut and polished
specimens seen in cabinets come from Malabar and Ceylon.
It is said, also, to occur in Egypt and Arabia.

Green quartz, Prase, Quarz byalin wed obfeur. The colour
is a leek green; it is seldom crystalized; the form of the
crystals are those of common quartz. Prase has been said
to owe its colour to an intimate mixture with actyno-
lite, but Klaproth is of opinion that this is not well ac-
tained.

Simpie is classed, by some mineralogists, with quartz. It
is of a deep blood-red colour, and perfectly opaque, or
barely transmits light on the edges. It resembles red jasper,
but has a vitreous lustre, and conchoideal fracture, and is
sometimes crystalized.

Ferruginous quartz consists of small crystals, or of granu-
lar quartz, intimately mixed with oxd of iron, and has a
brown ochre-yellow, or red colour. From the iron which
it contains it becomes magnetic when heated. It is harder
than pure quartz.

Certain properties, beside colour, have given names to
some varieties of quartz.

Fat quartz is so called because it has a greasy appearance,
as if the surface had been rubbed with oil.

Feticl quartz differs from common quartz, by emitting an
odour, which rubbed, like that of sulphurised hydrogen
gas. When this fossil is heated below a red heat, it looses
its fetid odour on cooling, and when plunged into water be-
comes transparent. When feticl it is nearly opaque. It is
found in the vicinity of Nantes and Chantilly, in the de-
partment of Haute Vienne, forming a constituent part of
the granitic mountains of that district. It occurs also in
the island of Elba.

Elastic stone is a siliceous sandstone, found in the Bra-
zils, composed of oblong lamini of quartz, arranged in
one direction, and so interlocked together as to form a kind
of hinge with each other, from whence it poftesses a certain
degree of pliability, like that of a fliff piece of leather. In
appearance, elastic quartz resembles some of the flaty sand-
stones in the northern counties of England. According to
Klaproth its constituent parts are

| Silex | 96.50 |
| Alumine | 2.50 |
| Oxd of iron and tols | 1 |

The use of quartz in the arts is principally confined to
the manufactures of glafs, enamels, porcelain, and earthen-
ware. The finer crystalizations are employed by the jewell-
ers, and before the discovery of glafs, ornaments and veils
of great value were made by the ancients from rock crystal.
Stones in which quartz forms the principal ingredient, are
belter fitted for purposes of durable architecture, and in the

The princi
economy of nature this mineral gives liability to the folded fabric of the globe, enabling those rocks and mountains in which it abounds to resist the decomposing effects of air and moisture, and to vary for ages the impetuous fury of the ocean. For the properties of flaxes, of which quartz is composed, see Silex.

QUARTZ ROCK, in Geology. Entire rocks and even mountains are composed of quartz in various parts of the world, in the vicinity of granitic districts. The quartz is granular, and sometimes intermixed with a small portion of mica. Werner classes quartz rock as a distinct order of primary rocks, but it would be perhaps more consonant with a natural arrangement, to consider this rock as a constituent of granite on a large scale, certain causes having separated the quartz, mica, and felspar into distinct masses. Entire mountains of these three subfamilies are laid to occur in the Uralian chain, presenting the materials of granite on a large scale. Quartz rocks are met with in Scotland. In the highlands the summits of some of the mountains are formed of white quartz, and appear as if covered with snow. The two beautiful conical mountains, called the Sugar-loaves, in the vicinity of Dublin, are composed of granular quartz, of a similar kind to what forms veins in the gneiss and mica flate of the surrounding mountains nearer Dublin.

QUARTZOSÉ, in Mineralogy, a term applied to those rocks or minerals which are principally composed of quartz.

QUASHING, in Law, the overthrowing and annulling a thing. Thus, pleas in abatement (which see), when the suit is by original, conclude to the writ or declaration; by praying “judgment of the writ, or declaration, and that the same may be quashed,” causatur, made void or abated; but if the action be by bill, the plea may pray “judgment of the bill,” and not of the declaration; the bill being here the original, and the declaration only a copy of the bill. See Plea, Dilatory Pleas, and Certiorari.

QUASI-CONTRACT, in the Civil Law, an act which has not the strict form of a contract, but yet has the force of it.

In a contract there must be the mutual consent of both parties; whereas, in a quasi-contract, one party may be bound or obligated to the other, without having given his consent to the act by which he is obliged.

For an example: I have done your business in your absence, without your procuration; and it has succeeded to your advantage; I have then an action against you for the recovery of what I have disbursed; and you an action against me, to make me give you an account of my administration; which amounts to a quasi-contract. See Contract.

QUASI-CRIME, or QUASI-DELICT, the action of a person who does damage, or evil, involuntarily.

The repARATION of quasi-crimes consists in making good the damages, with interest.

QUASI-MODO SUNDAY, Law Easter-Sunday, or the next funday after Easter; thus called from the initial words of the introit of the mass for the day, Quasi modo geniti infantes.

In the ancient deeds these words are signified by g. m. g.

QUASS, the name of a liquor in Ruffia, which serves the natives not only for drink, but also for sauce to a number of dishes; and is the basis of the favourite cold soup of the North, which is made by adding cold meat cut in pieces, with cucumbers salted after a peculiar manner, or with onions, or garlic, to a bowl of this subacid liquor. The common Ruffian quass is prepared by putting into a large pot full of cold water as much rye-flower as will make a thin dough; this is then placed in an oven moderately heated, for three hours, and afterwards taken out and thrown into a tub of cold water; the mixture is worked with a machine like a chocolate mill till it froths. To this liquor are added two hafons of the grounds of old quafs, leaven, or a piece of their four bread; and the tub is covered with a cloth, and laid by till the liquor has acquired a fourth taste, which marks its being ready for use.

There is a better sort of quass, which is prepared as follows. Take a chetverik (about 35 pounds Ruff, or 30 pounds Engl.) of barley-malt, two or three handfuls of rye-malt, and a like quantity of unbolted rye-meal; mix them all together in earthen pots, then pour boiling water upon it, and stir the whole till it acquires the consistence of a thin pap. The pots must be full to within an inch of the brim. Upon this mixture must now be poured about an inch in height of the husks of oats, from which groats are made. Set the pots in a heated oven, in which some glowing coals are still remaining, which must be heaped about the pots. This done, clofe the oven, and leave the pots in it four-and-twenty hours. This time being chpped, take them out; again pour boiling water in till they be brimful, and stir all well together. Now pour it all into a wooden vessel or tub, provided with a spiggot and follet, first covering the bottom with a layer of straw, as is usually done in brewing beer; then add warm water, more or less, according to the quantity of quafs you want; let it stand an hour, and afterwards draw it off into vessels. In every vessel a flice of coarse rye bread must be put in, in order to make it ferment. Set the vessels in a cellar, and after four-and-twenty hours the quafs is fit for drinking.

In making quafs, barley-malt alone may be used. The rye-malt is added only from necessity, when the former, by itself, would be too poor, and not be sufficiently sweet. But the rye-meal is absolutely necessary.

From the quantity of malt and meal above stated, is obtained about six or seven kilderkins, or two ankers of quafs. The Ruffians in the summer feast on the vesfels of quafs immediately in the cellar, but in the winter they let them stand a whole night in a warm room, for the quafs to ferment.

QUASSE, in Geography, a town of Africa, in Benin. N. lat. 6° 20'. E. long. 3° 50'.


Qu. Ch. Cal. Perianth inferior, very short, of five ovate, permanent leaves. Cor. Petals five, seclle, equal, lanceolate, elongated, oblique, converging. Nectary of five ovate villous scales, attached to the inside of the filaments at the base. Stom. Filaments ten, thread-shaped, equal, the length of the corolla; anthers oblong, incumbent. Pfl. Receptacle fleshy, elevated, orbicular, broader than the corolla. Germin ovate, composed of five separate ones; style thread-shaped, with five furrows, the length of the filaments; stigma with five angles. Pfl. Drupas five, diffus, horizontal, ovate, obtuse, sifting into two parts, all blanding on a fleshy pentalgonal receptacle. Seed fustular, globule or oval.

Obl. Some flowers have abortive germs, others imperfect anthers.
QUASSIA.


This is the true original Quassia, whose wood is more powerful than that of other species; but being very rare, and of small bulk, its place is that of being supplied by Q. excelata hereafter described.

2. Q. Simaruba. Wing-leaved Quassia. Linn. Suppl. 234. Wildl. n. 2. Ait. n. 2. Woodv. Med. Bot. t. 76. (Simarouba amara : Aulb. Guian. v. 2. 859. t. 331. 332.)—Flowers monoeccious. Leaves pinnate; leaflets alternate, not quite sessile; common stalk naked. Clusters panicked. — Native of various parts of the West Indies, in a sandy soil, flowering in November and December. It was sent to Kew in 1797, by Mr. Alexander Anderson, but has not bloomed there. This is a tall and flowering tree, whose wood is hard, lasting, without any peculiar flavour. Leaves alternate, with six, seven, or eight alternate obovate, rather narrow, entire, flaked leaflets, two inches long, whitish beneath; their common stalk simple, roundish. Flowers yellowish-white, much smaller than the preceding, either monoeccious, or, as some say, dioecious, in branched or panicked clusters. The bark of the root is bitter, and much celebrated as a cure for the dysentery. Dr. Wright has given a full history of the plant, with a plate, in the Transactions of the Royal Society of Edinburgh, vol. ii. It is known in Jamaica by the name of Mountain Damfion, Bitter Damfion, and Stave-wood. In that island, according to Dr. Wright, the male flowers are never found on the same tree with the female.

3. Q. excelata. Lofty Quassia. Swartz in Stockh. Trans. for 1788. 302. t. 8. Ind. Occ. v. 2. 742. Wildl. n. 3.—Flowers polygamous. Stamens five. Leaves pinnate; leaflets opposite, flaked; common stalk naked. — Native of rather mountainous woods, in Jamaica and the Caribbean islands. The English commonly call it bitter wood, or bitter ahl. The tree is lofty, with a very straight trunk; the wood whitish, moderately close-grained, very bitter; frequently sold by the druggists for the true Quassia amara, and found useful in intermittent fevers, debility of the stomach, worms, dropsy, and chlorosis. It is also used for making cabinets, for preserving insects, or other natural curiosities; this wood being supponed inacessible to worms. The leaves are larger than the last, and composed of from four to five pair of opposite, elliptical, pointed, firm, entire, smooth leaflets, on short partial stalks. Clusters panicled, bearing very numerous, small pale flowers, solitary, male, the red hermaphrodite in the same cluster. Swartz describes the nectaries, of five minute villous scales, contrary to the remark of Willdenow, under his Zwinger, Sp. Pl. v. 2. 569, where it is said to be wanting in this species of Quassia. The flowers are mostly five, rarely four or fix. Germs from two to four.

QUASSIA Amara, bitter quassia, in the Materia Medica. The root, bark, and wood of this tree are all comprehended in the catalogues of the Materia Medica; and it is observed that the leaves, flowers, &c. possess similar qualities. The roots, being perfectly ligneous, may be medically considered in the same light with the wood, which is now more generally employed, and seems to differ from the bark in being less intensely bitter; so that the latter is thought to be a more powerful medicine. The wood is sent to this country from Jamaica and the Carribbean islands in billets, and is reduced to chips, or raised by the druggists. Quassia has no fenible odour; its taste is that of a pure bitter, more intense and durable than that of any other substance. It imparts its virtues more completely to watery than to spirituous menstrua, and its infusions are not blackened by the addition of martial vitriol. When the infusion is evaporated to dryness, it leaves a brownish-yellow, somewhat transparent, brittle extract, which has been regarded as a vegetable constituent, and named the bitter principle. (Edinb. Phil. Trans. t. 227.) The infusion is rendered muddily by nitrate of silver, and a soot, flaky, yellow precipitate is formed; acetate of lead occasions a copious white precipitate; and hence it has been inferred that these faults are incompatible in formula with it. The watery extract is from a fifteenth to a ninth of the weight of the wood; the spirituous about a twenty-fourth.

Quassia derived its name, as has already been observed, from a negro named Quassi (by Fermin written Coiffi, and by Rolander, Quassi), who employed it with uncom- mon success, as a secret remedy in the malignant, endemic fevers, which frequently prevailed at Surinam. In conformance of a valuable consideration, this secret was disclosed to Daniel Rolander, a Swede, who brought specimens of the quassia-wood to Stockholm in the year 1756; and since that time the effects of this drug have been very generally tried in Europe, and numerous testimonies of its efficacy published by many respectable authors. Its antifeptic powers have been submitted to various trials, from which it has been concluded, that it has considerable influence in retarding the tendency to putrefaction; which, in the eyes of Dr. Murray's opinion, cannot be attributed to its sensible qualities, as it possesses no astringency whatever, nor to its bitternes, as gentian is much more bitter, but lefs antifeptic. The medicinal virtues ascribed to quassia are those of a tonic, nutritious, antiseptic, and febrifuge: it has been found very effectual in relieving the tone of the stomach, producing appetite for food, affilling digestion, expelling flatuency, and removing habitual colic, produced from debility of the intestines, and common to a febrifuge life. Dr. Letfom observes, that in hysteric stomy, to which the female sex is more prone, the quassia affords more vigour and relief to the stomach than the Peruvian barks, especially when united with the vitriol album, and full more with the aid of some armbent. In dyspepsia, arising from hard drinking, and also in diarrhœa, he exhibited the quassia with great success. Although he does not concur in opinion with Linneaus, who says, "I am quidem judice chinhamum longé superatur;" yet he has met with several instances of low remittent and nervous fevers, the symptoms of which the bark uniformly aggravated, though administered in inter- mittent doses favorably to its succees, in which quassia, or make-root, was usefully substituted. In each case, he mostly observed that there was great cessation in the hepatic fevers, and the debility at the same time discouraged copious evacuations. And in many fevers, without evident remissions.
remissions to warrant the use of the bark, whilst, at the
same time, increasing debility began to threaten the life of
the patient; the doctor found that quassia, or snake-root,
finely or combined, upheld the vital powers, and promoted a
critical improvement of fever, by which an opportunity
was offered for the bark to effect a cure. Dr. Cullen says,
(Mat. Med. vol. ii. p. 174), ‘‘I believe quassia to be an ex-
cellent bitter, and that it will do all that any pure and simple
bitter can do; but our experience of it in this country does
not lead us to think it will do more; and the extraordinary,
condemnations given of it are to be ascribed to the par-
tiality so often shown to new medicines.’’ It is said to have
been given, combined with nitric acid, with evident benefit
in typhus, and also in flour albus. It may be given in in-
fusion, which is the best form of administering it; or in pills
made from the watery extract. It may also be given in
bubblace in doses of from grs. x to 3j three or four times a day.
The official preparations are the ‘‘infusum quassiae’’ of
the London Pharmacopoeia, and the ‘‘tinctura quassiae’’
of that of Dublin. The infusion is prepared by macerating
for two hours in a lightly covered vessel a scropful of quassia-
wood, chipped, in half a pint of boiling water, and straining.
In hyleria, this may be combined with purgatives and
tincture of valerian; in atomic gut, with aromatics; and in
dyspeptic affections, with chalybes, sulphate of zinc, or
mineral acids. The dose is from f3j to f3ij, given twice or
thrice a day. The tincture is prepared by digesting for
seven days an ounce of chips of quassia-wood in two pints
of proof spirit; and then straining. This may be used in
the famous cafes as the infusion.

It is asserted that the brewers have, of late years, used
quassia-wood instead of hops. Beer made with it certainly
does not keep, says Thomson, but soon becomes muddy and
flat, has a mawkish taste, and runs into the aceto fer-
mentation. It is consequently less nutritious and wholesome
than which is properly hopped. Wood. Mat. Med.
Thomson’s Lond. Diph.

QUASSIA Simaruba. See SIMARUBA.

QUATCHEOU, in Geography, a town of Asia, in
the country of Hami; 30 miles E. of Tche-tcheou. N. lat.
40° 28’. E. long. 94° 27’.

QUATER-COUSINS, QUATRE-COUSINS, fourth cou-
sins, or the 4th degree of kindred.

Hence, when parents are at variance, it is said they are
not quater, or cater-cousins.

QUATERNIA FOlia, among Botanists. See LEAF.

QUATO, in Zoology. See StOMA PeniSULa.

QUATORZIEME, Fr., the 14th, or double octave
of the 7th. It is called the 14th, because 14 sounds must
be formed to pass diatonically from one of its terms to the
other.

QUATOTOMOMI, in Ornithology, the name of an
American bird of the wood-pecker kind, having a red crest
on its head, and two white lines running down the sides of
the neck to the breast. It is called by Nieremberg Pfeif
imbrifetus; which fer.

QUATOZTL. See TANAGRA LecuSOPHalo.

QUATRE FACARDS, Les, in Geography, four small
islands in the South Pacific Ocean, so named by M. Bou-
gainville, in the year 1768. S. lat. 18° 40’. W. long.
140° 30’.

QUATREFOIL, a decoration resembling a rose with
four leaves, which constantly occurs in pointed architec-
ture.

QUATRE-NATIONS, q. d. Four Nations, the de-
nomination of a college founded in 1661, by cardinal Ma-
zarin, for the education and maintenance of sixty children,
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natives of the four countries conquered by Lewis XIV.,
viz. fifteen for Fignerol and Italy, fifteen for Allfattia,
twenty for Flanders, and ten for Rouffillon.

QUATRICROMA, in the Italian Music, is what
we call a demi-femiquaver, thirty-two of which make a bar
in common time. See TUNE, and Triphe.

QUATRO CASE, in Geography, a town of Italy,
in the department of the Mincio; 17 miles S.E. of Mantua.

QUATROS, CORONADOS, Les, an island in the Pacific
ocean, discovered by Quiros in 1606. S. lat. 18° 40’.

QUATTROINO, in Commerce, a copper coin at Flo-
rence; also a money of account, 60 quattrini being equal
to 12 crasi, 1/4 paoli, or 2 lire. At Rome, the feso is
divided into 3/4 tettoni, 500 quattrini, or 1000 mezz quat-
trini; so that 5 quattrini make 1 paolo, and 3 paoli 1 tet-
tone. See SCudo.

QUATUOR, Lat., a name given to any musical com-
position, vocal or instrumental, in four parts, and in
dialogue, or a parte equale, when each have solo parts alter-
nately. The Italians sometime call a quattor quartello, but
more frequently quarto, and the English quarted.

A vocal quartet is a kind of song written for the four
voices; or for the composer to finish, as a trio or
chorus.

In the vocal quartet of a musical drama, four distinc-
characters should be supported both in the words and music,
according to the situation and state of mind of the several
personages who have petitions or complaints to make, or
answers to give.

The instrumental quartets of Haydn have been the de-
light of all that have performed, or heard them performed,
for full 30 years, and bid fair to continue to afford delight
for at least 50 years more.

QUATUOR Principalia Artis Musicæ, the title of a MS.
in the Bodleian library at Oxford (Digby 90.), which has
been ascribed to several authors. Anthony Wood gives it
to Tewkesbury, to whom it is likewise ascribed in the
Oxford Catalogue of MSS., with very little foundation.
Bishop Tanner has honoured Dr. John Hambois with this
production, a writer on music, who flourished more than a
century after this MS. was finished, as appears from the
teftimony of the writer himself.

There is, however, at Oxford, among the MSS. another
volume of Musical Tracts (Bodl. 515.), which had not
been sufficiently examined by any of the catalogographers
who have mentioned it; for, on a careful perusal and collation,
we found in it, besides the other tracts by Simon Tunfled,
or Tullede, a duplicate of the Quatuor Principia; and as
no doubt has been thrown upon Tunfled having been the
author of the two first tracts in the volume, it seems as if
we might venture, without doubt or hesitation, to assign to
him this amply, and, for the time when it was written, ex-
cellent treatise. That Simon Tunfled was a man of
sciences, and an able musician, as well as a doctor of divinity,
appears at the end of MS. Digby 90. After saying that
the book was finished in 1351, we have the following pas-
tage: ‘‘Ille autem anno regnis ear inter minores Oxoniæ
fratres, Simon de Tunfledo, doctor sacrae theologicae, qui in
musica pollebat, et eciam in septem liberalibus artibus.’’
Pits, Bale, Tanner, and all our biographical writers, speak
of him as a learned musician; and Pits enumerates the
Quatuor Principia among his writings. (De illult. Angl.
Script.) Simon Tunfledo, a Franciscan friar, born at Nor-
wich, was in such favour for his learning and piety, as to
be
be unanimously chosen provincial master of all England. He died at Bruzard, in Suffolk, in 1560.

The title of the tracts in the Oxford Catalogue of MSS. has occasioned the great diversity of opinions about the writer of the Quatour Principals; for No. 515 is entitled "De Musicæ continua et discreta, cum Diagramatisbus, per Simonem Tunstede, A.D. 1551." However, in the beginning of the volume, the author proposes to treat "De quatuor Principallis in quibus totius Musicæ radices con- sirunt," &c. which exactly agrees with the other MS.; and there is no difference from the beginning to the end, except in the omission of a kind of preface, or argument to the work, which appears in the tract ascribed to Tewkesbury (Digby 90.), beginning "Quaerammodum inter Tri- timum," and is omitted in that to which the name of Tun- stede is prefixed. Bodl. 515.

What the author calls the "Four Principals of Music," will be a forth from his own manner of dividing the work. In the first part or principal, containing nineteen chapters, he treats of music in general, its constituent parts and divi- sions. II. Of its invention, intervals, and proportions, twenty-four chapters. III. Of plain chant, and the eccle- siastical modes, fifty-eight chapters. IV. Of measured music, or time; of different, and their several divi- sions. This last principal is divided into two sections, of which the first contains forty-one chapters, and the second forty-nine.

The whole treatise fills a hundred and twenty-four folio pages; the diagrams, which are very numerous, are beautifully written, and illuminated with different coloured inks; and it seems to be in all respects the most ample and complete work of the kind which the fourteenth century can boast.

Quatuor Hominis Propositæ. See Propositi.

Quatuor-Vir, in Antiquity, frequently written III. Vir, is a Roman magistrate, who had three colleagues joined with him in the same administration.

To the quatuor-vir was committed the charge of con- ducting and setting the colonies fent into the provinces.

Upon unlucky accidents, and other dangerous affairs, it was usual to create quatuor-vir, with commissio to take care ne quid detrimenti reipublica caperet, that the republic were not prejudiced.

There were also quatuor-vir appointed to inspect and take care of repairs, &c.

Quauchochopitli, in Ornithology. See Picus Tricolor.

Quaver, in Muse, a measure of time, equal to one- half of the crotchet, or one-eighth of the semi-breve.

The quaver is marked by the character

The English quaver makes what the French call croche, crotchet, because of the hook at bottom. See Crotchet.

The quaver is divided into two semiquavers, noted and four demisemiquavers, marked See Characters.

Quavinging, the act of trilling, or shaking; or the running a division with the voice.

Quauhoyuatli, in Botany, a name by which some authors have called the tree, whole fruit is the calyx flutula of the shops. Hern. p. 87.

Quauhcuilui, in Ornithology. See Merops Gen- erus.

Quauhiyoamatli, in Zoology. See Sus Ta- jaffa.
flight walls are a sufficient defence; and in some places, where the rock is inaccessible, no walls are necessary. Here, however, are several redoubts and batteries. The principal battery, which points towards the basin, consists of twenty-two 24-pounders, two French 36-pounders, and two large iron mortars; this battery is flanked by another of fix guns, that commands the pales from the lower town. On the land side the fortifications are stupendous. When general Wolfe attacked this place, he thought it a vain attempt to make an assault on the side of the town which lies towards the water, where the rock is so steep, and so easily defended. In order to carry on the attack on the land side, he first attempted to land his troops some miles below the town, near the Falls of Montmorenci; but here he was repulsed by a large division of the French forces with loss. Foiled in his first attempt to get on shore, the brave Wolfe formed the bold design of ascending to the top of the banks above Quebec, commonly called the Heights of Abraham. After previous preparation, the soldiers clambered up the heights with great difficulty, and the guns were hauled up by means of ropes and pulleys fixed round the trees, with which the banks are covered from top to bottom. At the top the plain commences, and extends close under the walls of the city. Here the memorable battle was fought, in which the much lamented general fell, at the moment when all his noble exertions were about to be crowned with the successes which they so eminently merited. The spot where the illustrious hero breathed his last is marked with a large stone, on which a true meridional line is drawn. Although the great Wolfe found it so difficult a task to gain possession of Quebec, and it has been rendered much stronger since his time, the people of the United States imagine, that, in case of a rupture with Great Britain, it might be easily taken; and yet at the close of the year 1775, and the commencement of 1776, an attempt was made by American troops, under the command of Arnold and Montgomery, without success. On this occasion Montgomery fell, and Arnold's attempt, on the practicability and success of which he had previously boasted, proved fruitless. St. John's gate, which he endeavoured to force, and the adjoining walls, are stupendous; and the mere sight of them may convince any person, that an attempt to storm them must be altogether ineffectual, without the aid of heavy artillery, with which the Americans were not provided.

Independently of its fortifications, and situation on the summit of a rock, Quebec owes much of its strength and security to the long duration and extreme severity of the winter; as in that season it is wholly impracticable for a besieging army either to carry on any works, or to blockade the town. Mr. Weld says, that 5000 soldiers are necessary to man the works at Quebec completely. A large garrison is always kept in it, and abundance of stores of every description. The troops are lodged partly in barracks, partly in block-houses near Cape Diamond, which is the most elevated part of the point, and is reckoned to be upwards of 1000 feet above the level of the river. The Cape is strongly fortified, and may be considered as the citadel of Quebec; it commands the town in every direction, and also the plains on the outside of the walls. The evening and morning guns, and all falutes and signals, are fired from hence. Notwithstanding the great height of the rock above the river, water may be readily obtained even at the very top of it, by sinking wells of a moderate depth; and in some particular places, at the sides of the rock, it gushes out in large streams; and the water is of a very good quality. It is supposed, says Mr. Weld, that including the upper and lower towns and suburbs, there are at least 2000 dwellings; and the number of inhabitants, allowing six to a house, may be estimated at 12,000. Mr. Heriot says, that, in 1806, the number of inhabitants amounted to 15,000; and if this statement be correct, the increase must have been very rapid, for, in the year 1784, Quebec contained only 6472 inhabitants. About two-thirds of the inhabitants are of French extraction. The society is agreeable, and very extensive for a place of its size, which is owing to its being the capital of the lower province, and therefore the residence of the governor, different civil officers, principal lawyers, &c. The large garrison always maintained in it contributes to make it gay and lively.

The lower town is mostly inhabited by the traders who are concerned with the shipping, and it is a very disagreeable place. The streets are narrow and dirty, and, on account of the height of the houses in most of them, the air is much confined; and in the streets next the water, there is an intolerable stench from the shore when the tide is out. The upper town, on the contrary, is extremely agreeable; from its elevated situation, the air is very pure, and the inhabitants are never oppressed with heat in summer; it is, however, far from being laid out, the streets being narrow and very irregular. The houses are generally built of stone, and, except some few, built of late years, small and inconvenient. The chateau, in which the governor resides, is a plain building of common stone, situated in an open place, the houses round which form three sides of a oblong square. It consists of two parts. The old and the new are separated from each other by a spacious court. The former stands just on the verge of an inaccessible part of the rock; behind it, on the outside, there is a long gallery, from whence, if a pebble were let drop, it would fall at least sixty feet perpendicularly. This old part is chiefly taken up with the public offices, and all the apartments in it are small and ill contrived; but in the new part, which stands in front of the other, facing the square, they are spacious, and tolerably well finished, but none of them can be called elegant. This part is inhabited by the governor's family. The chateau is built without any regularity of design, neither the old nor the new part having even an uniform front. It is not a place of strength, as commonly represented. In the garden adjoining to it is merely a parapet wall along the edge of the rock, with embrasures, in which a few small guns are planted, commanding a part of the lower town. Every evening during summer, when the weather is fine, one of the regiments of the garrison parades in the open place before the chateau, and the band plays for an hour or two, at which time the place becomes the resort of numbers of the most genteel people of the town, and has a very gay appearance.

Opposite to the chateau there is a monastery belonging to the Recollets, or Franciscan friars; a very few only of the order are now left. Contiguous to this building is the college belonging to the Jesuits, whose numbers have diminished even still farther than that of the Recollets. The nunneries are three in number, and as there is no restriction upon the female religious orders, they are all well filled. The largest of them, called L'Hopital General, stands in the suburbs, outside of the walls; another, of the order of St. Ursule, is not far distant from the chateau.

The engineer's drawing-room, in which is kept a variety of models, together with plans of the fortifications of Quebec and other fortresses in Canada, is an old building, near the principal battery. Adjoining to it stands the
house where the legislative council and assembly of representatives meet, which is also an old building, that has been plainly fitted up to accommodate the legislature.

The armory is situated near the artillery barracks, in another part of the town. About ten thousand stand of arms are kept in it, arranged in a similar manner with the arms in the Tower of London, but, if possible, with greater neatness and more fancy.

The artillery barracks are capable of containing about five hundred men, but the principal barracks are calculated to contain a much larger number; they stand in the marketplace, not far distant from the square in which the chateau is situated, but more in the heart of the town.

The market of Quebec is extremely well supplied with provisions of every kind, which may be purchased at a much more moderate price than in any town visited by Mr. Weld in the United States. It is a matter of curiosity to a stranger to see the number of dogs yoked in little carts, that are brought into this market by the people who attend it. The Canadian dogs are found extremely useful in drawing burthens, and there is scarcely a family in Quebec or Montreal, that does not keep one or more of them for that purpose. They are somewhat similar to the Newfoundland breed, but broader across the loins, and have shorter and thicker legs; in general they are handsome, and wonderfull docile and fagacious; their strength is prodigious. A single dog will draw a man for a considerable distance, that could not weigh less than ten stone. People, during the winter season, frequently perform long journeys on the snow with half a dozen or more of these animals yoked in a cariole or sledge.

An attempt was made in 1711 by the English and Americans, under the command of brigadier Hill, to surprize Quebec; but it proved abortive. In 1759 it was taken by the English, under the command of the valiant Wolfe, who sacrificed his life in the engagement; and by the peace, in 1763, it was ceded, with the rest of Canada, to the conquerors, in whose possession it has since continued.

The scenery that is exhibited to the view from various parts of the upper town of Quebec, surpasses for grandeur, beauty, and fertility, any other, as Mr. Weld says, that he has seen, either in America, or in any other part of the globe. In the variegated expanses that is laid open before you, stupendous rocks, immense rivers, trackless forests, and cultivated plains, mountains, lakes, towns, and villages, in turn strike the attention, and the senses are almost bewildered in contemplating the vastness of the scene. Nature is here seen on the grandest scale; and it is scarcely possible for the imagination to paint to itself anything more sublime than are the several prospects presented to the sight of the delighted spectator. From Cape Diamond, situated one thousand feet above the level of the river, and the loftiest part of the rock on which the city is built, the prospect is considered by many as superior to that of any other spot. A greater extent of country opens upon you, and the eye is here enabled to take in more at once, than at any other place; but it appeared to Mr. Weld, that the view from the cape is by no means so fine as that, for instance, from the battery; for in surveying the different objects below you from such a stupendous height, their magnitude is in a great measure lost, and it seems as if you were looking at a draft of the country, more than at the country itself. It is the upper battery that Mr. Weld alludes to, facing the bafoon, and is about three hundred feet above the level of the water. Here, if you stand but a few yards from the edge of the precipice, you may look down at once upon the river, the vessels upon which, as they fall up to the wharfs before the lower town, appear as if they were coming under your very feet. The river itself, which is between five and six miles wide, and visible as far as the distant end of the island of Orleans, where it loses itself amidst the mountains that bound it on each side, is one of the most beautiful objects in nature, and on a fine still summer's evening it often wears the appearance of a vast mirror, where the varied rich tints of the sky, as well as the images of the different objects of the banks, are seen reflected with inconceivable lustre. The southern bank of the river, indented fancifully with bays and promontories, remains nearly in a state of nature, clothed with lofty trees; but the opposite shore is thickly covered with houfes, extending as along other parts of the river already mentioned, in one uninterrupted village, seemingly, as far as the eye can reach. On this side the prospect is terminated by an extensive range of mountains, the flat lands situated between and the villages on the banks not being visible to a spectator at Quebec, it seems as if the mountains rose directly out of the water, and the houfes were built on their steep and rugged sides.

Beautiful as the environs of the city appear when seen at a distance, they do not appear less on a more close inspection; and in passing through them the eye is entertained with a most pleasing variety of fine landscapes, whilst the mind is equally gratified with the appearance of content and happiness that reigns in the countenances of the inhabitants. Indeed, if a country as fruitful as it is picturesque, a genial and healthy climate, and a tolerable share of civil and religious liberty, can make people happy, none ought to appear less so than the Canadians. There are, however, in the vicinity of Canada two scenes, more particularly deserving of attention than any others: these are the falls or cataracts of the rivers Chaudiere and Montmorency; which see respectively. N. lat. 46° 48' 38", W. long. 71° 4' 29". Weld's Travels, vol. i.

QUEBITEA, in Botany, a name which seems to have been whimsically extracted by Aublet, from the Caribbean appellation of this plant, Dugueojabe. Aubl. Guian. v. 2. 838. t. 327. This has many creeping roots, and a twilled, decumbent, hairy stem, with alternate, elliptical, broad, entire, hairy leaves, three or four inches long, on hairy footstalks. Flowers minute, in short, dense, axillary, stalked filialae, with a small sepal at the base of the stalks. Aublet did not investigate the structure of these flowers, but he supposes the plant to be nearly akin to Dracemum, under which genus it is accordingly noticed by Jussieu. The roots, when chewed, are very acrid. The bruised herb is used externally, to cure the bite of serpents. It grows on the banks of rivulets in Guiana.

QUEBRANTAHUESOS, in Ornithology. See Proc.

QUECALA, in Geography, a town of Mexico, in the province of Mechoacan; 105 miles S.S.E. of St. Luis de Potosí.

QUECHUA, in Literary History. See Peru.

QUEDA, a sea-port city on the W. coast of the peninsula of Malacca, the capital of a kingdom, tributary to Siam, with a good harbour at the mouth of a river that will admit a vessel drawing 12 or 14 foot water on the spargle over the bar, which is gravel and mud. The town contains about 4000 houfes, inhabited by Chinese and Malays. The environs are agreeable and fertile; the woods abound in elephants and other animals, and in some places are mines of lead, which supply large quantities of these metals for exportation to Hindoostan, Arabia, and Perâ. The go
venom is monarchical, under a Malay Mahomedan prince, who, like many other Malay princes, engrosses almost the whole foreign trade of the port, excepting that of an annual Chinese junk, which pays a certain sum only as duty, and then has leave to trade freely with the inhabitants. This junk imports immense quantities of coarce China-ware, thin iron pipes, and many other articles from that country, and exports biche de mer, called swallow, sharks’ fins, edible bird’s nests, rattans, tin, rice, dammer, tortoise-shell, deer’s skins and finews, bullocks and buffalos’ hides and horns, jerked beef, and many other coarse articles. At Queda there is great plenty of rice, bullocks, buffalos, and poultry; but not such abundance of fruit and vegetables as at Acheen. The territory of Queda is a flat country, favourable for the cultivation of rice; a hill north of the town and inland, called the Elephant, favours the navigator’s approach; also the small islands called Peers, 20 miles west of the bar, covered with trees, and good regular mudfoundings, a great way off, even by night, indicate the distance to the mariner; 300 miles E.N.E. of Acheen. N. lat. 6° 20’. E. long. 100° 18’.

QUEDENAU, a town of Prussia, in Samland; three miles N. of Königsberg.

QUEDLINBURG, a town of Weiphalia, in the principality of Halberstadt, on the Boda, which divides it into the Old and New Towns. It has several churches, a hospital, and a college. Near this town is a princely abbey, situated on a hill: it was founded by King Henry I. between the years 932 and 936, and since enriched by various endowments. In 1539 it embraced Lutheranism, and obliged itself, by solemn oaths, to maintain that form of religion. It latterly confided of four dignitaries, viz. of the lady abbots and three others, distinguished by the titles of provost, dean, and canon. In 1802, the abbey and its revenues were voted to the king of Prussia, as an indemnity; and by the treaty of Tilsit, transferred to the kingdom of Weiphalia. The town of Quedlinburg is seven miles S.S.E. of Halberstadt. N. lat. 51° 48’. E. long. 11° 20’.

QUEDLITZ, a town of Prussia, in the province of Ermeland; four miles S. of Wartenburg.

QUECE, in Agriculture, a term sometimes provincially applied to the wood-pigeon, or birds of that kind.

QUEECHY, in Geography, a river of Vermont, which runs into the Connecticut at Hartford.

QUEEN, REGINA, a woman who holds the crown of a realm singly, and by right of blood.

The word queen is derived from the Saxon word, uxor, the wife of any one, but applied, by way of excellence, to the wife of the king only; whence she was anciently called the king’s queen; the West Saxons having no other name for a queen but the king’s wife. (Aélis Ælfréd, rebus, &c.) She was also called lady, in Saxon coelebys, just as madame, mademoiselle, were used in France, for the wife and daughter of the duke of Orleans.

The name queen is also given, by way of courtesy, to her that is married to the king; called, by way of distinction, queen consort. In respect of whom the former is called queen regnant, or regent.

The widow of a king is also called queen, but with the addition of dowager.

In the first sense, queen is, in all construction, the name with king; and has the same powers, prerogatives, rights, dignities, and duties that the king has. This is expressly declared by statute 1 Mar. I. r. 3. c. 1.

The queen consort is inferior, and a person distinct from, and a subject of, the king. In England, though she be a feme-covert, yet may she sue, and be sued, in her own name; and may make leaves, and grants, &c. as a femme.

She has several other prerogatives. Though an alien, she may purchase lands in fee-simple, without either naturalization, or denization; she may present to a benefice; nor is plenary a bar against her more than against the king. She is also capable of taking a grant from the king, which no other wife can do from her husband; and she may have a separate property in goods as well as lands, and has a right to dispose of them by will. She pays no toll, and shall not be amerced, if she be non-suited in any action; and may not be implored till first petitioned.

To confine her death, or violate her chastity, is high treason. She has an ancient pecuniary revenue, called queen-gold; besides a very large dower, with a royal court, and officers, distinct from the king’s; and her attorney and solicitor-general are entitled to a place within the bar of his majesty’s courts, together with the king’s counsel.

Another ancient perquisite belonging to the queen comfort, mentioned by all our old writers, and, on this account only, worthy of notice, is this, that on the taking of a whale on the coasts, which is a royal fish, it shall be divided between the king and queen; the head only being the king’s property, and the tail of it the queen’s. One reason of this whimsical division, as ascribed by our ancient records, was to furnish the queen’s wardrobe with whalebone.

The queen dowager, as the widow of the king, enjoys most of the privileges belonging to her as queen comfort. But it is not high treason to confine her death; or to violate her chastity, because the succession to the crown is not thereby endangered. Yet still, pro dignitate regali, no man can marry a queen dowager without special licence from the king, on pain of forfeiting his lands and goods. She has also this particular, that she loses not her dignity, though she marry a private gentleman; as peers and dowers do their peers, when they marry commoners. Thus queen Catherine, widow of Henry VII. being married to Owen ap Tudor, esq. maintained an action as queen of England. Much less does a queen regnant follow her husband’s condition, or is subject to other queens; but she is sovereign to her own husband, as queen Mary was to king Philip, and queen Anne to prince George of Denmark; unless it be otherwife appointed by parliament. The husband may be guilty of high treason against her; but in the instance of conjugal infidelity, he is not subject to the same penal restrictions. For which the reason seems to be, that if a queen comfort is unfaithful to the royal bed, this may debaue or bale around the heirs to the crown; but no such danger can be conphenent in the infidelity of a husband to a queen regnant.

QUEEN CAROLINE, in Biography, when princes of Wales, is told in the dedication of the opera of Julius Cesar to her royal highness, that the first musical sounds which her highness heard, were those produced by the voice of the celebrated Pitocci, the father of good taste, then in the service of his illustrious fire, at the court of Anpach.

Music doubtless was a ferious part of her majesty’s education, as it is, and has ever been, of all the princes and princesses of Germany; who have likewise frequent opportunities of hearing great performers and splendid performances; yet we do not recollect having heard that her majesty was a performer herself, or even an admirer or patron of the art. This princess died in November 1737.

QUEEN MARY. (See MARY.) During the short reign of this bigoted and intolerant princes, ecclesiastical music was again
QUE

again transferred to Latin words and the mafs, both of
which had been excommunicated during the reign of
her brother, Edward VI. But metrical psalmody had not yet
been generally received in our parochial churches. Mary
was herself a performer on the virginal and lute, as appears
by a letter sent to her by her mother, queen Katherine,
after her separation from the king, in which she encour-
ges her to fulfill cheerfully, to trutl to God, and keep her
heart clean. She charged her in all things to obey the
king's commands, except in matters of religion. She sent
her two Latin books, the one De Vita Chrifiit, and the
other the Epiftles of St. Jerome; in them, (fays the
queen,) I truft you shall fee good things. And sometimes,
for your recreation, ufe your virginals or lute, if you have
any."

Fuller tells us, that "eight weeks and upwards paffed
between the proclaiming of queen Mary and her anfembling
the parliament; during which time two religions were
of{er together yet on foot, Protestantifme and Poperie; the former
hoping to be continued, the latter labouring to be reformed;
—and during this interim the churches and chapels in Eng-
land had a mongrel celebration of their divine services be-
twixt reformation and fuperition. For the oleques for
king Edward were held by the queen in the Tower,
August 7th, 1553, with the dirige fong in Latin, and on
the morrow a maffe of requiem, and on the fame day his
(ores were buried at Westminifter with a femon fervice,
and communion in Englih."

In October following the laws of her predecessor, Ed-
ward, concerning religion, were all repealed. And in
November 1554, bishop Bonner "let up the old worship
at Paul's, on St. Katherine's day; and it being the fucum,
that on fome holydays, the queire went up to the fleeple to
fing the anthems, that fell on that night —and the next
day, being St. Andrew's, he did officiate himfelf, and had
(a folemn procefsion.)"

After this period, during the fubfequent years of Mary's
reign, the public fervice was every where performed in the
Roman Catholic manner, throughout the kingdom; and
we may imagine that the numerous comifions to Latin
words, which have been preferved of Dr. Tye, White, Tallif,
Bird, and the reft of our moft eminent harmoniifts, were
produced, and performed at that time, while the Romih
religion had the effeciant. And indeed it appears by a
record, now in the pofeifion of the Antiquarian Society,
that the lift of Mary's chapel efhablishment contains nearly
the fame names as that of her brother Edward.

QUEEN ELIZABETH. (See Elizabeth.) In speaking of
music during the long and prosperous reign of queen
Elizabeth, our nation's honour seems to require a more dif-
fufe detail than at any other time: for perhaps we never had
fo jufi a claim to equality with the reft of Europe, where
music was the moft successfully cultivated, as at this period;
when indeed there was but little melody anywhere. Yet,
with refpect to harmony, canon, fugue, and fuch laboured
and learned contrivances as were then chiefly studied and
admired, we can produce fuch proofs of great abilities in
the comifions of our countrymen, as candid judges of
their merit muft allow to abound in every kind of excel-
ience that was then known or expected.

Elizabeth, as well as the reft of Henry VIII.'s children,
and indeed all the princes of Europe at that time, had been
taught music early in life. For Camden, in giving an ac-
count of her fludies, says, that "she underftood well the
Latin, French, and Italian tongues, and (was) indifferently
well fen in the Greek. Neither did she neglect muftic,
so far forfcbe as might become a princefle, being able to fing
and play on the lute prettily and sweetly."

There is reafon to conclude, that she continued to amufe
herself with music many years after she acceded the throne.
Sir James Melvil gives an account of a curious converfation
which he had with this princes, to whom he was fent on
an embafly by Mary, queen of Scots, in 1564. After her
majefly had alked him how his queen dreffed? What was
the colour of her hair? Whether that or her's was bell? Of
which of them two was fairest? And which of them was
highcliff in figure? "Then she alked, what kind of ex-
erces the ufed?" I anfwered, fays Melvil, "that when
I received my dispatch, the queen was lately come from the
Highland hunting: that when her more ferior affairs per-
mitted, she was taken up with reading of histories; that
fometimes she recreated herfelf in playing upon the lute and
virginals. She alked if the played well? I faid, reafo-
nably for a queen."

"The fame day, after dinner, my lord of Hunfden drew
me up to a quiet gallery, that I might hear fome music,
(but he faid, that he durft not avow it,) where I might
hear the queen play upon her virginals. After I had
hearkened a while, I took by the taffet that hung before
the door of the chamber, and feeing her back was toward
the door, I entered within the chamber, and ftood in a pretty
fpace hearing her play exceflently well. But the left off
immediately, fo soon as she turned about and faw me. She
appeared to be burpried to fee me, and came forward,
feeming to strike me with her hand; alleging, the ufed
not to play before men, but when she was foltary, to fheen
melancholy. She alked how I came there? I anfwered,
as I was walking with my lord Hunfden, as we paffed
by the chamber door, I heard fuch a melody as ravifhed me,
whereby I was drawn in ere I knew how; excufing my
fault of homeliefs, as being brought up in the court of
France, where fuch freedom was allowed; declaring myfelf
willing to endure what kind of punishment her majefly
Should be pleafed to inflict upon me for fo great offence.
Then she fate down low upon a cufhion, and I upon
my knees by her; but with her own hand she gave me a cufhion,
to lay under my knee; which at fift I refufed, but the
compelled me to take it. She enquired whether my queen
or fhe played belt. In that I found myfelf obliged to
give her the prafe."

If her majefly was ever able to execute any of the pieces
that are preferved in a MS. which goes under the name of
"Queen Elizabeth's Virginal Book," the muft have been
a very great player: as fome of these pieces, which were
compofed by Tallis, Bird, Giles, Farnaby, Dr. Bull, and
others, are fo difticult, that it would be hardly poiffible to
find a master in Europe, who would undertake to play one
of them at the end of a month's practice.

Besides the lute and virginals, Elizabeth was a performer
on the viol and on an instrument something like a lute,
but stringed with wire, and called the palpham. A violin
of a fingular conftuction, with the arms of England, and
the crest of Dudley, earl of Leicelteer, this queen's favourite,
engraved upon it, was purchaffed at the fale of the late
duke of Dorfet's effects. The date of its make, 1578. It
is very curiously carved; but the leveral parts fere fo thick
and loaded with ornaments, that it has not more tone
than a mute, or viol in a fordine; and the neck, which is
too thick for the grip of the hand, has a hole cut in it
for the thumb of the player, by which the hand is fo con-
ined, as to be rendered incapable of shifting: fo that no-
thing can be performed upon this inftrument, but what lies
within the reach of the hand in its firft position. Playford
tells
tells us, that “Queen Elizabeth was not only a lover of this divine science (music), but a good proficient therein; and I have been informed, (says he;) by an ancient musician, and her servant, that she did often recreate herself on an excellent instrument, called the poliphant, not much unlike a lute, but flinging with wire.”

Among the Sloane MSS. in the British Museum, No 1520, there is a list of the officers of the court of revenue in this reign; in which is included the musical establishment of her majesty’s household, about the year 1587.

**Musicians.**

<table>
<thead>
<tr>
<th></th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>The servant</td>
<td>24</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Trompeters sixteen</td>
<td>24</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Chief lute</td>
<td>40</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chief harper</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rest of the lutes</td>
<td>19</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The other of the harps</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>And</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bagpipe</td>
<td>12</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Minstrels nine, whereof seven at every of them; one at and thother at</td>
<td>24</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Six children to sing Rebeck two</td>
<td>28</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Sackbutt fix, whereof five having by the year, and one at</td>
<td>36</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Vials eight, whereof fix at one at and thother at</td>
<td>30</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Players on the virginals three, one at and two at and thother two at</td>
<td>50</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Players on the flute two, at a piece</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Musitons strangeurs seven, whereof fix have and one</td>
<td>38</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Drumflulls three, every of them</td>
<td>18</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Players on the flute two, at a piece</td>
<td>18</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Makers of instruments: Regall-makers</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Players on enterludes eight, every of them p. ann.</td>
<td>60</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Organ-maker</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Her majesty’s chapel establishment was nearly the same, in number and salaries, as that of her brother and father, Edward and Mary. Indeed, it seems as if the religious scruples of musicians had been considerably diminished by the severity with which Tellwood had been treated in the time of Henry VIII., and the peril into which Marbeck’s zeal for reformation had involved him. For in comparing the chapel establishments of Edward, Mary, and Elizabeth, we find, that however the creeds of these monarchs differed, their musicians had constantly tuned their confidences to the court pitch: i.e. in perfect union with the orders of their sovereign, the supreme head of the church.

Cameron says, that “the Romish religion remained a full moneth and more after the death of queen Mary, in the same state as before.” For Elizabeth, who began her reign November 17th, 1558, had a solemn service performed for her lady Mary at Weftminder, December 5th, and another December 25th, for the emperor Charles V.; and thefe, as well as her own coronation, were celebrated in the Romish manner.

Burnet says, that “Elizabeth had been bred up from her infancy with a hatred of the Papacy, and a love to the Reformation; but yet as her first impressions in her father’s reign were in favour of such old rites as he had still retained; so in her own nature she loved flate, and some magnificence, in religion as well as in every thing else.”

We have no other music printed expressly for the cathedral service to English words during the reign of Edward VI. than that of Marbeck, which was mere canto fermo, without counterpoint; but the year after the publication of the English Liturgy, by queen Elizabeth, the following choral work appeared: “Erturne nos,” in two and three parts, to be sung at the Morning Communion, and Evening Prayer; very necessary for the Church of Christ to be frequented and used; and unto them be added divers Psalmes and Hymnes, in the like form, to the honour and praise of God. Printed at London, under Artillery-gate, beneath St. Dunstane, by John Day, 1566.” The authors of these compositions were Tallis, Cavilton, John- son, Oakland, Shepherd, and Taverner.

In 1565, our ecclesiastical composers, encouraged probably by the reception of the former publication, and favour of the queen, printed another collection of offices, with musical notes, under the following title: “Morning and Evening Prayer and Communion, set forth in four parts, to be sung in Churches, both for Men and Children, with hyms and other Holy Prayers and Antiphons, of sundry Modern Voyage.”

The musicians who contributed to this collection were Thomas Cavilton, Heath, Robert Hasleton Knight, John- son, Tallis, Oakland, and Shepherd.

Thefe two publications by John Day, fixed, for near a century, the style of our choral music; of which the movement was grave, the harmony grateful, and the contrivance frequently ingenious.

The great musicians of queen Elizabeth’s reign were Dr. Tye, John White, Thomas Tallis, William Bird, Dr. Bull, and Thomas Morley. And these, as ecclesiastical composers, were perhaps equal in learning and genius to the greatest contemporary contrapuntists on the continent of Europe.

We must not terminate our account of the cultivation and progress of music by queen Elizabeth and her subjects, without making honourable mention of her majesty’s “Virginal Book,” and referring for a summary account of its contents to Bird, William. In all our enquiries after musical curiosities throughout Europe, we have met with no pieces so elaborate and difficult for the harpsichord, as those by our ingenious countrymen.

This book, equally valuable for its antiquity and contents, was purchased at Brenner at Dr. Pepusch’s sale, 1762, whose property it was to the time of his death. After which it passed into the hands of vifcount Fitzwilliams, in whose possession, we believe, it still continues.

It is a magnificent folio MS. curiously bound in red Morocco, with gilt leaves. There are nearly 70 pieces by Dr. Bull in this volume. The writing is small, but uncommonly neat, upon fine lines. The compositions are in general extremely elaborate and difficult; particularly those by Bird, Dr. Bull, and Giles Farnabie, who have all contributed largely to the furnishing of this volume, which contains near three hundred pieces. The first movement in the book is an old English tune, called “Wallingham,” beginning in C natural, and ending in A major, which Dr. Bull has varied in a most full and complicated style, thirty different ways. Signora Margarita, the wife of Dr. Pe- pusch, when she quitted the Opera stage, applied closely to the practice of the harpsichord; upon which instrument she became a great proficient. However, with all her own diligence and talents, affified by the science and experience of
of her husband, she was never able to vanquish the difficulties of this piece, by Dr. Bull. And several of Dr. Pepusch's friends and pupils, who went frequently to his apartments at the Charter-house, have allied us, that though this manuscript was constantly open upon her harpichord desk, she never advanced to the end of the variations; as seems likewise manifest from the colour, as well as wear and tear, of the leaves, which are much more clean and entire in every other part of the book, than at the first strains of this composition.

Queen Mary II. joint sovereign with William III., seems to have done little more for music, than patronize Mrs. Arbabella Hunt, and the old Scots tune of "Cold and raw the wind doth blow." See Mary.

Queen Anne, in Geography, a poll-town of America, in Prince George county, Maryland, situated on the W. side of Patuxent river, across which is a wooden bridge. This small town is laid out on a regular plan, at the foot of a hill. It contains a few stores, and warehouses for the inspection of tobacco; 25 miles E.N.E. of Washington.

Queen Anne's, a county of Maryland, bounded W. by Cheapeake bay, and N. by Kent county; containing 16,648 inhabitants. Its chief town is Centerville. Belonging to this county is Kent island, 14 miles long from N. to S. and 5½ broad from E. to W. It is low, but the land is fertile, and its eastern side is bordered with salt marsh.

Queen Catherine's Foreland, the northernmost point of Terra del Fuego, at the east entrance into the straits of Magellan, discovered by Frobisher in 1576.

Queen Charlotte's Portland, the S.E. extremity of New Caledonia. N. lat. 22° 15'. E. long. 165° 14'.—Also, the S.W. point of New Hanover, in the East Indian sea, fo called in 1767 by Capt. Carteret. The land about it is remarkable for a number of little hummocks, or hills. S. lat. 2° 29'. E. long. 148° 27'.

Queen Charlotte's Island, an island in the Pacific ocean, about six miles long, and one broad, discovered in the year 1767, by Captain Wallis. It is described as sandy and level, full of trees, without underwood, and abounding with scurvy-grass. The coves of this island appeared to be about 30 feet long, 4 feet broad, and 3½ deep. The inhabitants were of a middle stature, and dark complexion, with long black hair, hanging loose over their shoulders. The men were well made, and the women handsome. Their garments were a kind of coarse matting, fastened about their middle, and capable of being brought round their shoulders. The men who landed saw no appearance of any kind of metal, but observed several tools made of shells and stones, sharpened and fitted into handles, like adzes, chisels, and awls. They had several repositories of the dead, in which bodies were left to putrefy, under canopies, and not deposited in the ground. The island was taken possession of by Captain Wallis and his crew, in the name of his Britannic majesty. They also left some hatchets, nails, glass bottles, beads, shellings, oxharness, and half-pence, as presents to the natives. S. lat. 19° 18'. W. long. 135° 4'.

Queen Charlotte's Islands, a group of islands, discovered in 1767 by Capt. Carteret, conflicting of Egeomt's island or New Guernfey, Lord Howe's island or New Jersey, and several others. A quarrel having occurred in consequence of the imprudent conduct of the master of Capt. Carteret's ship, between the crew and the natives, several of the latter were killed, and four of the former died in consequence of their wounds. This unfortunate event prevented any intercourse with the inhabitants of these islands. Egeomt island, says Capt. Carteret, who called it by this name in honour of the earl, is the same with the Santa Cruz of the Spaniards; and the place in which the ship had lain he called Swallow bay; about ten miles W. from this bay is a small island, near the coast, called Portland's island; and to the bay farther west, where the ship's cutter had been attacked by the Indians, he gave the name of Bloody bay. In this bay is a small rivulet of fresh water, and here were seen many hoves, and near the water-side, one much longer than any of the rest, which seemed to be of a kind of common hall, or council-house, and was neatly built and thatched. The hives and the floor of this edifice were covered with a kind of fine matting, and bundles of arrows were hung up in it ready for use. At this place there were also many fine gardens and plantations, included by a fence of stone, and planted with cocoa-nut trees, bananas, plantains, yams, and other vegetables. About three miles W. of this town was another of considerable extent, in the front of which, near the water, was a breast-work of stone, about four feet six inches high, angularly formed like a fortification; from which, and from other circumstances, there is reason to believe that the natives have frequent wars among themselves. At the distance of two or three miles farther westward was found a small bright, receiving a river, which was called Granville's river, and westward of it is a point, to which was given the name of Ferrar's point. From this point the land forms a large bay, near which is a town of great extent, and apparently very populous. About seven miles W. of Ferrar's point is another, that was called Carteret's point, from which a reef of rocks, that appears above water, runs out to the distance of about a cable's length. To the W. of this was another large town, fronted like the last, and the people who resided to the beach while the ship was passing, performed the same kind of circular dance with those of the former place. They were furnished with a number of canoes of different sizes. The inhabitants of Egeomt island are extremely nimble, vigorous, and active, and seem as well qualified to live on the water as on the land, for they were in and out of their canoes almost every minute. With their bows and arrows they do execution at an incredible distance. Their arrows were pointed with flint, nor was there seen among them any appearance of metal. The country, in general, is woody and mountainous, intersected with many valleys; several small rivers flow from the interior part of the country into the sea, and upon the coast there are many harbours. S. lat. 29° 30' to 11° 20'. E. long. 163° 30' to 165° 10'.

Hawkesworth's Voyages, vol. i. p. 349, &c.

Queen Charlotte's Islands, called by Capt. Gray, of the United States, who visited them in 1789, and by American navigators, "Washington islands," a group of islands on the N.W. coast of America. See Queen Charlotte's Island.

Queen Charlotte's Sound. See Queen Charlotte's Sound. Mr. Anderdon, who visited this island four times, has made the following remarks on the country near it. The land is every where uncommonly mountainous, rising immediately from the sea into large hills, with blunted tops. At considerable distances are valleys, or rather impoundments on the sides of the hills, which are not deep, each terminating towards the sea in a small cove, with a pebbly or sandy beach, behind which are small flats, where the natives generally build their huts, at the same time landing their canoes upon the beaches. The bases of these mountains, at least towards the shore, are constricted of a brittle, yellowish sandstone, which acquires a bluish cast, where the sea washes upon it. It runs, in some places, in horizontal, and, at other places, in oblique strata; being frequently divided, at small distances, by thin veins of coarse quartz. The mould, or foil, which covers this, is of a yellowish cast, not unlike marle, and is commonly
commonly from a foot to two or more in thickness. The quality of this soil is best indicated by the luxuriant growth of its productions: the hills being one continued forest of trees, owing the strength of their vegetation partly to the soil, and partly also to the agreeable temperature of the climate. In February, corresponding to our August, the thermometer was not higher than 66°; and in June, corresponding to our December, the mercury never fell lower than 48°. The weather is, in general, good; but sometimes windy, with heavy rain, which, however, never lasts above a day; nor is it ever excessive. Among the trees, which covered the hills, and which are of two sorts, one supplied the place of spruce in making beer, for which purpose a strong decoction of its leaves was fermented with treacle or sugar. The other fort of tree resembled a maple, and its wood served for fuel. On the small flat spots behind there is a great variety of trees. Among other plants that were useful, may be reckoned the wild celery, which grows plentifully almost in every cove, and one that was called icurry-grass, though very different from the plant to which we give that name. Both forts were boiled every morning, with wheat ground in a mill, and with portable foup for the people's breakfast, and amongst their peafl-foup for dinner. Sometimes they were used as fallad, or drefled as greens. There is another plant, which produces a fine flaky flux, of which the natives make their garments. A species of long pepper is also found in great plenty. The birds are almost entirely peculiar to the place. The principal fish caught with the feine were mullets and elephant-fish, with a few foles and flounders; but those which the natives mostly supplied were a fort of sea-bream, of a silver colour, with a black spot on the neck, large conger- eels, and a fih in shape like the bream, but so large as to weigh five, fix, or seven pounds, and called *Mogge* by the natives. Of all the forts of fish, which are here numerous, the mogge, small falamon, and colour fih, as the feamen called them, though different from ours, are superior to the rest. The rocks furnish a great variety of shell-fih. Infects are very rare. In this extensive land there are not even traces of any quadruped, excepting only a few rants, and a fort of fox-dog, which is a domestic animal with the natives. Neither is there any mineral worth notice, but a green jasper or ferpent-tone, of which the New Zealanders make their tools and ornaments.

The natives do not exceed the common stature of Europeans, and, in general, are not so well made. Their colour is of different calls, from a deep black to a yellowish or olive tinge; and their features are also various, some remem- bering Europeans. But in general their faces are round, with their lips full, and also their noses towards the point; though the firt are not uncommonly thick, nor the last flat. Their teeth are generally broad, white, and well set; and their eyes large, with a very free motion, which seems the effect of habit; their hair is black, ftrait, and frong; commonly cut short on the hind part, with the raft tied on the crown of the head; but some have it curling, and of a brown colour. In the young, the countenance is generally free or open; but in many of the men it has a serious ffair, and sometimes a fulleness or referve, especially if they are strangers. The women are in general smaller than the men; but have few peculiar graces. The drefs of both sexes is alike; and con- fifts of an oblong garment, about five feet long and four broad, and made of the flaky flax before mentioned. This seems to be their moft material and complex manufacture, and is executed by knotting; and their work is often orna- mented with pieces of dog-flax, or chequered at the corners. They bring two corners of this garment over their shoulders, and flant it on the back, with the other part which covers the body; and about the belly it is again tied with a girdle made of mat. Sometimes they cover it with large feathers of birds, (which seem to be wrought into the piece of cloth when it is made,) or with dog-flax; and that alone sometimes worn as a covering. Over this garment many of them wear mats, which reach from their flhoulers to their heels. But the most common outer covering is a quantity of fedge-plant, badly drefled, which they flant on a ftring to a considerable length, and throwing it about the shoudlers, let it fall down on all sides, as far as the middle of the thighs. By way of ornament, they fix in their heads feathers, or combs of bone or wood, adorned with pearl-fhell, or the thin inner fkin of some felf; and in the ears both of men and women, which are pierced, or rather flit, are hung small pieces of Jasper, bits of cloth, or beads, when they can get them. A few also have the ceptum of the nofe bored in the lower part. They wear long beards, but are fond of having them shaved. Some are punctured or flained in the face, with curious spiral and other figures, of a black or deep blue colour; but it is doubtful whether this be ornamental, or intended as a mark of peculiar distifion; and the women who are marked, have the puncture only on their lips, or a small spot on their chins. Both sexes, often fbein their faces and heads with a red paint, which seems to be a martial ochre, mixed with greafe; and the women sometimes wear necklaces of shark's teeth, or bunches of long beads, which fean to be made of the leg-bones of small birds, or a particular fhell. They live in small coves, in companies of forty or fifty, or more; and sometimes in single families, building their huts contigus to each other; which are in general miserable lodging places. The belt was about thirty feet long, sixteen broad, and fix high; built exactly in the manner of an English barn. They fean to have no other furnifhement than a few small fifeletts or bags, in which they put their fiping-hooks and other trifes. They live chiefly by fishing, making use either of nets of different kinds, or of wooden fifeletts, pointed with bone; but fo oddly made, that a stranger would be at a loss to know how they can answer such a purpofe. Their boats are well built of planks, raifed upon each other, and fastened with ftring withes, which also bind a long narrow piece on the outside of the fems, to prevent their leaking. Some are fifty feet long, and fo broad as to be able to fail without an outrigger, but the smaller fort commonly have one; and they often fallen two together by rafters, forming a double canoe. They carry from five to thirty men, or more; and often have a large head, ingeniously carved, and painted with a figure at the point, which fean intended to repreffent a man with his features deforted by rage. Their paddles are about four or five feet long, narrow, and pointed; with which, when they keep time, the boat is pushed along pretty swiftly. Their fail, which is seldom used, is made of a mat of a triangular fhape, leaving the broadeft part above. Their method of feeding corresponds with the naflines of their perfons, which often fmean disagreeably, from the quantity of greafe about them, and their clothes never being washed. We have seen them eat the vermin with which their heads are plentifully flocked. They also used to devour with the greatest eagerness large quantities of flinking train oil, and blubber of fads, which we were melting at the tent, and had kept near two months; and on board the fhips they were not fatisfied with emptying the lamps, but actually swallowed the cotton and fragrant wick with equal voracity. These people manifefl as much ingenuity, both in invention and execution, as any uncivilized nations under similar circumfances. For, without the ufe of any metal tools, they make every thing by which they procure their subsistence, clothing, and warlike weapons,
weapons, with a degree of neatness, strength, and convenience for accomplishing their several purposes. Their chief mechanical tool is formed exactly after the manner of our adzes, and is made, as are also the chisel and gouge, of the Jasper already mentioned, or of a black, smooth, and very fidiite. But their master-piece seems to be carving, which they use for various purposes, even the most trivial. Their substitute for a knife is a shell, a bit of flint or Jasper; and as an anger, they fix a shark's tooth in the end of a small piece of wood. They have also a small saw made of some jagged fishes' teeth, fixed on the convex edge of a piece of wood, nicely carved; but this, they say, is only used to cut up the bodies of their enemies whom they kill in battle. No people have a quicker sense of injury done to them, and none are more ready to refer it. Their temper is sanguinary and irritable; and they are so disinclined, that they steal everything upon which they can lay their hands. Such conduct may be expected, where little subordination exists, and where no man's authority seems to extend further than his own family. Their public contests are frequent, or rather perpetual, and it appears, from their number of weapons, and dexterity in using them, that war is their principal profession. These weapons are spears, patons, and halberts, or sometimes flones. The first are made of hard wood, pointed, from five to twenty, or even thirty feet in length. The short ones are used for throwing as darts. The "patoon," or "emette," is of an elliptical shape, about eighteen inches long, with a handle made of wood, flite, the bones of some fes animal, or green Jasper, and seems to be their principal dependence in battle. The halbert, or long club, is about five or six feet long, tapering at one end with a carved head, and at the other broad or flat, with sharp edges. Before they begin the onset, they join in a war-song, to which they all keep the exact time, and some raise their passion to a degree of frantic fury, attended with the most horrid distortion of their eyes, mouths, and tongues, to strike terror into their enemies: which, to those who have not been accustomed to such a practice, makes them appear more like demons than men, and would almost chill the boldest with fear. To this succeed circumstances, almost foretold in their fierce demeanour, horrid, cruel, and difgraceful to human nature; which is, cutting in pieces, even before they are perfectly dead, the bodies of their enemies, and, after dressing them on a fire, devouring the flesh, not only without reluctance, but with peculiar satisfaction. And yet these savages lament the loss of their friends; with a violence of expression, which indicates the most tender remembrance of them. The children are initiated, at a very early age, into all the practices, good and bad, of their fathers. They not only join in the war-song, but they likewise sing, with some degree of melody, the traditions of their forefathers, their actions in war, and other indifferent subjects; of all which they are immediately fond, and spend much of their time in these amusements, and in playing on a sort of flute. Their language is far from being harsh or disagreeable, though the pronunciation is frequently guttural, and whatever qualities are requisite in any other language to make it musical, certainly obtain to a considerable degree here, if we may judge from the melody of some of their songs. It is also sufficiently comprehensive, though, in many respects, deficient, if compared with our European languages, which owe their perfection to long improvement. Mr. Anderson has given a specimen of it. (Cook's Third Voyage, vol. i.) In the year 1770 Capt. Cook left among the inhabitants a boar and two fows, with some vegetables for cultivation. In 1773 he saw one of the fows, and found that the other and the boar were both living. The sheep and goats did not succeed; the latter having been killed by one of the natives, and the ram having run into the sea.

Queen's, the middle county of Long Island, New York, about 30 miles long, and 12 broad, containing six townships, and 19,236 inhabitants. Jamaica, Newtown, Hempstead, in which is a handsome court-house, and Oyster bay, are the principal towns in this county.

Queen's County, a county of Nova Scotia, comprising a part of the lands on the cape, on the S. side of the bay of Fundy. The settlements are as follow: viz. Argyle, on the S. side of the bay of Fundy, where a few Scots and Arcadians reside: next to this is Yarmouth, settled chiefly by emigrants from New England; Barrington, within the island, called Cape Sable, settled originally by Quakers from Nantucket. Besides these are Port Royal, so called by the French, and originally settled by the North Irish; Liverpool and Rofeway, settled and inhabited by emigrants from New England.

Queen's County, a county of Ireland, established in the reign of the first Mary, which comprehended the old district of Leix. Both the county and chief town, Maryborough, received their names in compliment to the sovereign. It is situated on the S.W. of Kildare, from which it is partly divided by the river Barrow, and is of a very compact form, being 25 Irish (nearly 32 English) miles in length, and as many in breadth. The superficial contents are about 235,300 acres, or 367 square miles, equal to 378,033 acres, or about 590 square miles English. There are 59 parishes, 96 only of which have churches, and a population of 82,000 according to Dr. Beaufort, and about 90,000 as the medium of various calculations. The high and steep mountains of Sliebhe-bloom (called also Ard-na-Erin, which in the Irish language signifies the height of Ireland) form so impracticable a barrier between the King's and Queen's counties, that in a range of fourteen miles they afford but one, and that a very difficult and narrow pass into the King's county, called the "Gap of Glandine." In this great ridge are the sources of the Barrow and the Nore; the Barrow running N.E. to Monalteeven, where it changes its direction to the S., and the Nore crossing the Queen's county by a southern course into Killkenny. The Dyfart hills in the eastern division are conspicuous and picturesque, standing rather singly than connected. From these eminences, through the vales formed by their particular situation, is commanded the view of a fine and beautiful country, highly adorned with rich plantations and magnificent demesnes. The rest of the county is rather flat, but lies high. The whole is watered with rivers and numerous mountain streams, and according to Sir Charles Coote, its superficial appropriations may be thus estimated.

<table>
<thead>
<tr>
<th>Description</th>
<th>Acres</th>
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</thead>
<tbody>
<tr>
<td>Arable lands, pature, and meadow</td>
<td>210,000</td>
</tr>
<tr>
<td>Woods and plantations</td>
<td>1,300</td>
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<tr>
<td>Water</td>
<td>1,000</td>
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<tr>
<td>Bog, mountain, and waste</td>
<td>21,000</td>
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<tr>
<td>Roads</td>
<td>2,000</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>235,300</strong></td>
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</tbody>
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The map belonging to the grand jury, reckons 244,938 acres, and of these 60,000 bog and mountain. Almost every description of soil is found in this county, and it varies from a very stiff clay to a sandy loam, which, though light, is yet fertile; a strong gravelly soil, very favourable to corn, is also prevalent. Lime-stone is so common, that there are rich quarries of it in almost every township. Thesoil
foil of the Sliabh-bloom mountains is variable, the surface inclining to a black and alternately yellow flint clay, of unequal depths, covering a loamy, rotten rock, or a gritty gravel, with occasionally a little appearance of lime-flint. The western side, more generally, inclines to a strong red clay, not unlike the nature of the soil in load of the northern counties in Ireland, where oats and potatoes only are grown; but it generally is, throughout, spoungy, wet, and boggy to the summit, and very rocky. Through the whole of the county, except in the south-eastern corner, near Carlow, where the colliers are extensive, bog is well intermixed, and is the general fuel. The depth of these bogs is various, and in some parts undifeovered, the bent fuel lying in lanes a few fapades depth below the surface, in others very deep. The mounds are a shallow bog, with a stratum of gravel or clay, under one or two fapades depth; this particular kind is easily reclaimed, and becomes the beet and furthest land in the county, and the coal is here but trifling, indeed often repaid in one year, having all the materials within themselves.

Amongst the mineral productions of this county, for Charles Coote, the author of the Statistical Survey, enumerates "coal, iron, copper, manganese, mica, lime-flint, marble, free-flint, ochre, marle, fuller's-earth, and a great variety of clays valuable in every branch of pottery." Such an enumeration is of little use; being recommended neither by detail of facts and places, nor by accuracy of information. The coal district is in another part of the same work more fully noticed; but the reader who wishes for information, is more likely to find it in the report of Mr. Griffith, mining engineer of the Dublin Society, which is shortly to be published. The coal is of that description called flint coal, the glance-coal of Jameson, and best known by the name of Kilkenny coal. The Queen's county colliers seem to have laboured under many disadvantages, from want of capital or of proper exertion; but a prospect is opening upon us of more attention to this source of wealth. There is a very small quantity of old timber in the Queen's county. There are, indeed, leaves still in existence, by which the tenant was obliged to cut, burn, or destroy so many acres of wood, to clear the land for the plough; a system which, if necessary to the establishment of order in the county, was the cause of reducing it to the bare flate with respect to timber, with which the English traveller is so often struck. The Barrow and the Nore are the principal rivers which water this county. The latter is not navigable, though, being a fine deep and spacious river, it might be easily rendered so, by levelling the numerous weirs, that are of great detriment to the adjoining lands, and throw up a considerable quantity of back water.

The Barrow is navigable throughout from Portarlington, near which it beautifully expands and winds through extensive and fertile banks. There are no lakes which defer notice. Maryborough is the county town, near which, as well as Mountmelich and Mountrath, there was a considerable woollen manufacture of stuffs, &c. which has declined. For any particulars respecting the towns, the reader is referred to the respective articles. Besides those mentioned, Portarlington is a place of some importance, and Stradbally a neat town. The county is represented in parliament by two knights of the shire, and by one member for the borough of Portarlington. Maryborough and Ballynekill were disfranchised at the union. Sir C. Coote's Statistical Survey. Beaufort's Memoir.

Queen's River, a river of the island of Dominica, which runs into the sea near Roseau.

Queen Bee, a term given by late writers to what used to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every swarm, and which is always treated with the greatest respect by the rell.

It is well known that the generation and whole economy of bees principally depend upon this female sovereign, and that her presence is absolutely necessary to the prosperity and safety of the whole community; inasmuch that the loss of the queen proves the certain and total destruction of the swarm or hive, unless the owner supplies them in time with another ruler. Without her presence and direction, the other bees will do no manner of work; they will gather neither wax, nor honey, nor any other materials; nor can they breed and propagate their kind without her. A flock deprived of its queen, would yield to robbers, or fly languish and pine away, so that the whole society would perish.

But as soon as a languishing flock is supplied with a queen, pleasure and activity are apparent through the whole hive; the presence of the sovereign refines vigour and exertion, and her voice commands universal respect and obedience; of such importance is the queen to the existence and prosperity of the other members of this community. As the parent and sovereign of every swarm is a female, the whole government is vested in one; so that where there happen to be more, as there sometimes are, and especially in swarms that are united, confusion and discord prevail, until all, except one, are expelled and slain.

As in forming artificial swarms, and for other purposes, it will be necessary to distinguish the queen from the other bees, we shall observe, that she may be known by her size, which is much larger than that of the common working-bees, and longer than that of the drones; by the form and shape of her body, especially of the hinder part of it, which is more taper, and terminates in a much sharper point than the bodies of the other bees, in order the more readily to reach the bottom of the cells, where the eggs are deposited for the propagation of the species (see Generation of Bees); and also by her colour; her upper parts being scarlet at all different in this respect from the honey-bees, but her belly and legs are of a very deep yellow, resembling the purest and the richest gold. It is said that the may also be distinguished by the note of her voice, which is an octave; and by being one of the last which falls with her belly upwards, when the bees of a single flock are dropped into an empty hive, in order to be united with those of another flock.

Naturalists have observed, that the queen-bees are produced in a manner peculiar to themselves, and different from the drones and working-bees. Some have supposed that the eggs laid by the queen in a hive, and destined for the production of queen-bees, are of a peculiar kind; but though this is not the case, as M. Schirach has lately discovered, yet there are particular cells appropriated for this purpose. These cells are generally near the edges, and at the bottom of the combs, and sometimes on the sides of a honey-comb; they are of an oblong orbicular form, and very strong; and are more or less numerous in different hives, as occasion seems to require. It has been also supposed, that the matter with which they are nourished is of a different kind and quality from that employed for the nourishment of the other classes; that which has been collected out of the royal cells being of a gummy glutinous nature, of a deep transparent red, and dissolving in the fire rather than crumbling to powder.
It has been generally supposed, that the queen-bee is the only female contained in the hive; that the drones are the males by which she is fecundated; and that the working-bees are neutral, or of neither sex. But M. Schrach has lately established a different doctrine, which has been also confirmed by the later observations of Mr. Debrav. According to this writer, all the working or common bees are females in disguise; and the queen-bee lays only two kinds of eggs, viz. those which are to produce the drones, and those from which the working-bees are to proceed; and from any one or more of these, one or more queens may be produced; so that every worm of the latter or common kind, which has been hatched about three days, is capable, under certain circumstances, of becoming the queen, or mother of a hive. In proof of this doctrine, new and singular as it may seem, he alleges a number of satisfactory and decisive experiments, which have been since verified by those of Mr. Debrav. For the proof of this doctrine by Schrach and Debrav, and the objections of Mr. Hunter, we refer to the article Generation of Bees.

From this doctrine we may justly infer, that the kingdom of the bees is not, if the expression may be used, a pure divina, or hereditary monarchy, but an elective kingdom, in which the choice of their future ruler is made by the body of the people, while she is yet in the cradle, or in embryo; and who are determined by motives of preference which will perhaps for ever elude the penetration of the most sagacious naturalists.

The conclusions drawn by M. Schrach, from experiments of the preceding kind, very often repeated by himself and others with the same success, are, that all the common or working bees were originally of the female sex; but that when they have undergone their late metamorphosis, they are condemned to a state of perpetual virginity, and the organs of generation are obliterated; merely because they have not been fecundated, fed, and brought up in a particular manner, while they were in the worm state. He supposes, that the worm designated by the community to be a queen, or mother, owes its metamorphosis into a queen, partly to the extraordinary fize of its cell, and its peculiar position in it; but principally to a certain appropriate nourishment found there and carefully administered to it by the working bees, while it was in the worm state; by which, and possibly other means unknown, the development and extension of the germ of the female organs, previously existing in the embryo, is effected; and those differences in its form and fize are produced, which afterwards so remarkably distinguish it from the common working bees. Schrach's Histoire Nat. de la Reine des Abeilles, &c. 8vo. 1772. Or, for an abstract, Monthly Review, vol. xlviii. p. 564, &c. Phil. Trans. vol. lxvii. part i. p. 29, &c. See Generation and Sex of Bees.

This discovery is capable of being applied towards forming artificial fwarms, or new colonies of bees, by which means the number of these useful insects might be increased, and their produce in honey and wax proportionably augmented. M. Schrach, as well as M. Helforff, feem, however, to have been mistaken, when they affert, that the artificial queens, formed and reared in a community consisting only of working bees, proceed almost immediately to lay eggs, and to people the hive, without having had any communication with the drones, and at a time when, as they supposé, there were no drones in being. It is not necessary to admit the idea of the prolific quality of a virgin queen-bee; as nature has provided drones of different sizes, for the purpose of impregnating the eggs laid by the female, and continuing the species, adapted to different circumstances and situations. See Drone.

Queen's Bench. See King's Bench, &c.
Queen's Gilliflower, or Violet, in Botany. See Hemp.
Queen Gold. aurum regina, an ancient royal revenue, belonging to the queen of England, during her marriage to the king; and payable by divers persons (upon several grants of the kings) by way of oblation out of fines, amounting to ten marks, or upwards; viz. one full tenth part above the entire fine, or ten pounds for every hundred pounds fine, on pardons and contracts or agreements. This becomes a real debt to the queen, by the name of aurum regina, upon the party's bare agreement with the king for a fine, and recording it without any farther promise, or contract, for this tenth part extraordinary.
Queen of the Meadows, in Botany. See Spiraea.
Queen's Ware. See Pottery.
Queen's Theatre in the Haymarket, now the Opera-house, was built in queen Anne's time by sir John Vanburgh, and not finished till the summer of 1705, at which time there were only two theatres open; Drury Lane, and Lincoln's-Inn-Fields. Betterton, who was at the head of the Lincoln's-Inn-Fields company, removed to the new theatre in the Haymarket, April 9th, 1705; when it was opened with a new prologue, written by Sir Samuel Garth, and spoken by Mrs. Bracegirdle. The play was Dryden's " Indian Emperor," with singing by the Italian boy, April 23d, " The Merry Wives of Windsor," Falstaff by Betterton, with dancing by Mad. de la Val. And on the 24th, a new farce called "The Confutation;" after which was performed an Italian pageant, called the "Loves of Ergafo," set to music by Giacomo Greber, the German musician, who had brought over from Italy Margarita de l'Epine; the part of Licoria by the Italian boy. And this was the first attempt at dramatic music in the Opera-house. The company continued acting plays here till the end of June, when there were three representations of "Love for Love," acted all by women. July 20th, according to the Daily Courant, Betterton and his company returned to the theatre in Lincoln's-Inn-Fields, where they continued to act till the Queen's theatre was entirely finished. We are the more minute about the performances in this theatre, as Cibber's account, which has been generally followed by others, is very inaccurate. October 30th, Betterton and his company quitted Lincoln's-Inn-Fields a second time, and returning to the Haymarket, opened that theatre, which was now played in. This excellent comedy, though the parts were very strongly cast (Leigh, Dogget, and Booth, being among the men, and Mrs. Barry, Mrs. Porter, and Mrs. Bracegirdle, among the women,) ran but nine nights successively, though the performance of M. des Barques, a dancer just arrived from France, was added to the entertainment. It was, indeed, repeated once in November, and twice in December, this year; but it was generally found necessary, even in a new theatre, and with so strong a company, to fortify the bell plays with dances or music, and often with both. Sometimes there was singing in Italian and English, by signorina Maria, as lately taught by signor N. Haym; and sometimes music composed by signor Bonvicini, and songs by signorina Lovicini, &c. See Daily Courant.

QUEENBOROUGH, in Geography, a borough and market-town in the liberty of the isle of Shepey, late of Seray, and county of Kent, England, is situated about three miles south from Sheerness, and forty-five miles by south from London. It was anciently called Cyningburgh, from belonging
longing to the Saxon kings, who had a castle here, near the western entrance of the Swale, which, after the conquest, was denominated the castle of Sheep. This fortress being totally demolished in the reign of Edward III., that monarch commenced, in 1350, a more extensive and magnificent one, which was finished in the period of six years, under the superintendence of the celebrated William of Wykeham, afterwards bishop of Winchester. When the castle was completed, Edward came and resided in it several days, during which time he constituted the then village a free borough, and ordered it to be called Queenborough, in honour of his comfort Philippa of Hainault. By the charter of incorporation, which bears date in 1366, he conferred fundry privileges upon the burgesses, and empowered them to elect a mayor, two bailiffs, four jurors, a town fejeant, and a water bailiff, who were to take their oath of allegiance before the constable of the castle, and to act as justices of the peace within the liberty of the corporation. This charter was confirmed, with additional privileges, by king Charles I.

Queenborough consists chiefly of one street, which is very wide, and is formed mostly of modern buildings. According to the parliamentary returns of 1811, the borough, which coincides in extent with the parish, contains 163 houses and 805 inhabitants, who are principally fishermen and oyster dredgers. The market days are Monday and Thursday weekly, and there is a well-attended fair on the 5th of August. This town sends two members to parliament, who are elected by the mayor, jurors, bailiffs, and burgesses, about 150 in number, though by the last decision of the house of commons in 1725, the elective franchise was declared to reside only in the mayor, jurors, and common council. The mayor is the returning officer, and the patronage is in the admiralty and board of ordinance.

Of the castle built by king Edward, no traces remain except the moat by which it was surrounded, and a well, by which it was supplied with water, as the town still is. Though a large and massive structure, and erected, as the letters patent express it, "for the strength of the realm, and for the refuge of the inhabitants of this isle," it does not appear to have ever been of any particular use, at least it is never mentioned in history as having been belted, or occupied as an important military post. It was nevertheless several times repaired; first by Richard II., and again in the time of Henry VIII. Queen Elizabeth also seems to have contributed to its preservation and embellishment, as her arms were displayed on the ceiling of the great hall, surrounded by those of the nobility, and principal gentry of the county, with the date 1553, affixed to some panegyrical verses in honour of that princess. The church here was originally built as a chapel to Minster, a village situated about two miles from the town, and deriving its name from the minster, or nunnery founded there by St. Olave, abbot of Ercombert, king of Kent, about the year 693. That princess placed twenty-three nunns in her new establishment, and took upon herself the office of abbess; which the afterwards resided to her daughter Ermengild, and retired to Ely, where her sister Etheldreda prefided.

During the incursions of the Danes, this nunneri was deserted and nearly destroyed; but when their invasions ceased, it was again tenanted by a few nuns, and continued to exist, though in a very mean state, till the year 1130, when the buildings were re-edified by Corbel, archbishop of Canterbury, and filled with nuns of the order of St. Benedict. At the dissolution their number was limited to a prior and ten nunns, whose estates were estimated at 129l. 7s. 10d. annual rent. These, with the site of the suppressed monastery, were then granted to Sir Thomas Cheynell, lord warden and treasurer of the household to king Henry VIII. Of the buildings, a gate-house, and part of the church, are the only remains. The latter consists of two aisles, a chancel, and a nave chapel, with the lower division of a square tower at the west end. In conformity with the date of its erection, some of the arches are semicircular in form, but most of them are in the early pointed style. In the south wall of the chancel, under a range of cinquefoil arches, is the effigy of a knight templar, said to represent and commemorate Sir Robert de Shurland, lord of Shurland, who was created a knight bannerman by Edward I., for his gallant conduct at the siege of Carlaverock, in Scotland. Behind the figure, towards the back of the recess, is the representation of a horse's head in the act of swimming, which has given rise to much enquiry among antiquaries, and to many fabulous and superfluous stories among the vulgar. On the pavement are several brasses of knights and their ladies; and under the arch separating the chancel from the chapel, is a gorgeous altar-tomb in honour of Sir Thomas Cheynell, above-mentioned. Another altar-tomb, near it, bears the recumbent figure of a Spanish general, or admiral taken prisoner by Sir Francis Drake, on the defeat of the "Invincible Armada." From an entry in the parish register, it appears to have died on board a ship at the Nore in 1591. " Beauties of England and Wales, vol. vii. by E. W. Brayley.

QUEENSURY, a township of America, in Washington county, New York, bounded easterly by Westfield and Kingbury; 35 miles N.E. of Albany.

QUEENSFERRY, South, a royal burgh and sea-port town in the county of Linlithgow, Scotland, is situated on the southern shore of the Firth of Forth, at the distance of nine miles W.N.W. from Edinburgh, on the great road to the north. It is first mentioned in the charters of king Malcolm IV. by the designation of "Passagium Regis," as is generally supposed from the frequent use of the ferry here by his great-grandmother Margaret, queen to Malcolm Canmore, a princess highly celebrated in Scottish history for her charitable and benevolent qualities. At that period, however, it was only a village and port, endowed with some trifling privileges; indeed, its constitution as a royal burgh did not take place till about the year 1556, when its elevation to that rank was strenuously opposed by the corporation of Linlithgow. It is now governed by a provost, one land bailiff, two sea bailiffs, a dean of guild, and a town council, who, like most other townships in royal burghs, are self-elected. Formerly this port enjoyed a considerable trade, and even so late as the year 1640, it was frequented by above twenty ships belonging to resident owners; but its traffic is at present confined to the importation of coal, for the consumption of the inhabitants, and of the materials used in the manufacture of brown soap, which, with the fisheries and the business of the ferry, constitute the chief support of the town. The harbour is in good repair, and is frequently resorted to as a place of retreat in hard gales, by the smaller vessels navigating the Forth. The pabbage here does not exceed two miles in breadth; and, except in very boisterous weather, may be crossed at all times with safety and expedition. Much obscurity prevails relative to the founding of this ferry. The right of it is private property, and seems originally to have been attached to the lands of Murie Hall, which lie in the vicinity of the town, and are traditionally said to have been appropriated for "upholding the pabbage." The present proprietors are several gentlemen possessors of land on either side of the Forth, who let the pabbage yearly by public auction. As all the northern mails, and most carriage travellers, pass at this ferry, the intercourse between its shores is constant and regular. Cattle also are transported
ported over in great numbers, as well as carts and waggons; but the difficulty and danger of effecting these objects, have induced cattle-drivers and carriers to go round by the bridge at Stirling.

The parish of Queensferry is of small extent, being confined entirely to the royalty. In eccllesiastical matters it forms part of the provostry of Linlithgow, and synod of Lothian and Tweeddale; and, according to the population returns of 1811, contains 77 houses and 558 inhabitants.

On the summit of the ridge rising from the shore here, stands Hopetoun-house, the seat of the earl of Hopetoun, which is perhaps equal in magnificence of aspect to any palace or residence in Great Britain. The mansion is seated on a noble lawn, forming a kind of terrace along the Forth for more than a mile in front, and only terminated by the Frith, which winds round it, and appears like a wide and extensive lake, interpersed with islands and enlivened with a variety of shipping. Behind the house the ground is more various, breaking into hills, vallies, and promontories, which shoot into the Forth. All the grounds, to a considerable distance, are planted and adorned; and the house is judiciously flanked with a thick wood, to protect it against the violence of the northern winds. On this side the Forth assumes, at different points, different appearances, sometimes putting on the semblance of a lake, and sometimes that of a river. The house is a very noble display of architectural magnificence. It was begun by the celebrated architect Sir William Bruce, and finished by Mr. Adam, who is believed to have added the wings. It must be regretted, that the interior of this princely mansion does not correspond with the grand scale of the exterior, in the fize and decorations of the apartments. Beauties of Scotland by Robert Forsyth, vol. iii. Carlisle's Topographical Dictionary of Scotland, 4to. 1813.

QUEENSFERRY, North, a small sea-port town in the district and parish of Dunfermline, Scotland, is situated on the northern shore of the Frith of Forth, opposite to the royal burgh of South Queensferry, described in the preceding article. The principal export is whin-stone for paving, which is found in vast abundance in the extensive "whin-stone quarries" adjoining. Of that material a large proportion is conveyed to London, and many towns on the eastern coast of England. A hamlet, called St. Margaret, between this village and the headland, which forms the western boundary of Inverkithing bay, is noted as the landing place of prince Edgar Atheling, and his sister Margaret, afterwards queen of Scotland, when they fled from England to avoid the effects of the conqueror's jealousy of Edgar's claim to the English crown. By an act of parliament, lately passed, the ferry has been placed under excellent regulations; and the harbour on each side, but particularly on the north side, has been much enlarged and improved. A signal house here contains apartments for the accommodation of the travellers, the superintendant, and boatmen. Carlisle's Topographical Dictionary of Scotland, 4to. 1813.

QUEEN'S-HOPE, or EAST-HOPE, a town in the parish of Elyin, or Hope, county of Wigtown, Dumfries, and county of Flint, North Wales, is situated near the river Alun, at the distance of six miles N.W. from Wrexham. Together with the adjoining village and hamlet of Caer-Gwrle, it constitutes a burgh, both by prescription, and in virtue of a charter granted by Edward the Black Prince in 1351. That deed orders that the probable of the cattle shall be mayor, ex officio, and shall nominate two bailiffs, to govern under him, from among the burgesses. This place obtained the appellation of Queen's-Hope, after the year 1282, from the circumstance of its having been then bestowed by Edward I. on his beloved and heroic confessor Eleanor; or, as some affirm, from her majesty having lodged here, when on her way to Caernarvon to give the Welsh a ruler born within their own territories. The etymology of its ancient name, "Caer-gawer-le," (the camp of the gigantic legion,) seems to indicate that it was once occupied by the Romans; and in confirmation of this conjecture we may observe, that a Roman hypocaust has lately been discovered here, some of the tiles used in the construction of which were inscribed "Legio XX." Pennant supposes that it was an outpost to the grand station Deva, and notices the remains of two roads. The ruins of the castle of Caergwrle are feated on a lofty rock isolated from the surrounding land, and, on one side, extremely precipitous. At what time, or by whom it was originally built, is unknown; but in the reign of Owen Gwynedd, it formed part of the possessions of a chieftain named Gwyffyd Maclor. Edward I. made a grant of it to Prince David, and, afterwards, as above-mentioned, to queen Eleanor, at whose death both castle and manor were given to John de Cremwell, on condition that he repaired the former, which had been left to, and considerably damaged, as was supposed, by design, while the king and queen were resident in it. All that remains of this once magnificent fortress, is a circular tower, and a few fragments of walls, together with the deep fosse, by which it was defended. This fosse is excavated from the solid rock, which is composed of breccia, or an exceedingly coarse grit.

The conjoint borough of Queen's-Hope and Caergwrle, is contributory with the town of Flint in the election of a representative to the British parliament. It formerly had the privileges of a market and fairs, but these are now discontinued. The parish is divided into two districts, called Hope and Kinnerton, and contains, according to the parliamentary returns of 1811, 547 houses and 2617 inhabitants. Of these a large proportion reside in the town, which consists of three broad parallel streets, intersected at right angles by three others of less breadth, the whole placed on the side of a rising ground, gently sloping to the river. The principal building is the church, which contains two mural monuments, one decorated with kneeling figures, but without any inscription; and the other commemorating Sir John Trevor, knt. secretary to the earl of Nottingham, the conqueror of the boated invincible armada.

Some objects in the vicinity of the place claim notice. On a hill, opposite to that of Caergwrle, is the British encampment of Caer-Elyin, which is formed by a single ditch and rampart. The adjacent summits consist chiefly of limestone, and display on their surface numerous organic examples of the fossil remains called entrochi and aliroches. The uncommon species of the latter, usually denominated the arboreous fa-dlar, has been found here. At Rhuddlan are two springs strongly impregnated with muriate of soda, the waters of which are found highly serviceable in such chronic disorders as elephantiasis and scrofula. At this place is a fine old bridge over the river Alun. On the road to Mold, about two miles from Queen's-Hope, is Plas-Teg, the seat of the Trevor family. The house is a very noble building, and is generally believed to have been the work of Inigo Jones. Beyond this is Harts-Heath Hall, the property of Guillem Lloyd Wardle, esq. It is a large modern manor, forming a square, with three fronts, and is surrounded by fine plantations. Carlisle's Topographical Dictionary of Wales, 4to. 1812. Pennant's Tour in Wales.
QUEENSTADT, a town of Westphalia, in the principality of Halberstadt; three miles N.E. of Halberstadt.

QUEENSTOWN, a port-town of America, in Queen Anne's county, Maryland, on the E. side of Cheslet river; six miles S.W. of Centerville, and 65 from Washington.

QUEENSTOWN, a town or village of Upper Canada, which lies on the W. side of the straits of Niagara, near fort Niagara, and seven miles below the Falls. It is at the head of navigation for ships; and the portage occasioned by the Falls of Niagara commences here. From the sudden change in the face of the country in the neighbourhood of Queenstown, and the equally sudden change in the river with respect to its breadth, depth, and current, it has been conjectured, that the great falls of the river might originally have been situated at the spot where the waves are so abruptly contracted between the hills; and moreover it is a fact well ascertained, that the falls have receded very considerably since they were first visited by Europeans, and that they are still receding every year. See Weld's Travels, vol. ii. p. 130.

QUE.SAN ISLANDS. See Chusan.

QUE ESTATE, in Law, a place whereby a man entitling himself to land, &c. faith, that the same estate which another had, he now has from him. Thus, e. g. the plaintiff alleges that such four persons were feised of lands whereby to the adowfore in question belonged in fee, and who did present it; and that afterwards the church was vacant; que est estate, i. e. which est be now has; and, by virtue thereof, he presents, &c. See PRESCRIPTION.

QUE EST MEME, a term used in actions of trespass, &c. for a direct justification of the very act complained of by the plaintiff as a wrong.

Thus, in an action upon the case, the plaintiff laying the lord threatened his tenants at will in such fort, as he forced them to give up their lands; the lord in his defence pleads, that he paid to them if they would not depart, he would sue them at law. Que est meme, i. e. this being the same threatening that he used, the defence is good.

QUEGASCA HARBOUR, in Geography, a bay on the S. coast of Labrador. N. lat. 50° 9'. W. long. 61° 22'.

QUEL, in Natural History, a name given by the Chinese to a peculiar earth found in many parts of the East.

It is of the nature of an unburnt clay, and in some degree approaches to the talcs, as our flatites and the galates do. It is very white and abderive, used by the women of China, to take off spots from the skin, and render it soft and smooth, as the Italian ladies use the same. They sometimes use the fine powder of this stone dry, rubbing it on the hands and face after washing; sometimes they mix it with pomatum.

QUEICH, in Geography, a river of France, which passes by Landau, and runs into the Rhine, near Germerheim.

QUECHUN, a city of China, of the second rank, in the province of Quang-fi. N. lat. 23° 22'. E. long. 166° 44'.

QUEGE, a town of France, in the department of Mont Blanc; four miles N.E. of Conflans.

QUEIGNE, a town of Africa, in the kingdom of Bambouk.

QUELING, a city of China, and capital of the province of Quang-fi, derives its name from a flower called "quei," which grows on a tree resembling a laurel; it exhales a sweet and agreeable odour, that the whole country around is perfumed with it. This city is situated on the banks of a river, which throws itself into the Ta-ho; but it flows with such rapidity, and amidst narrow valleys, that it is neither navigable nor of any utility to commerce. Quei-ling is a large city, and the whole of it is built almost after the model of our ancient fortresses; but it is much inferior to most of the capitals of the other provinces. Birds are found in great numbers in the territories belonging to it, the colours of which are so bright and variegated, that the artificers of this country, in order to give additional luster to their silks, interweave with them none of their feathers, which have a splendour and beauty that cannot be imitated. Quei-ling has under its jurisdiction two cities of the second class, and seven of the third. N. lat. 25° 12'. E. long. 107° 51'.

QUEIOS, a river of Spain, in Navarre, which runs into the Ebro, near Tudella.

QUEIRA, a town of Africa, in Ludanam; eight miles S. of Benown.

QUEIS, a river of Silefia, which rises in the principality of Jauer, passes by Friedberg, Grieffenberg, &c. and joins the Bober, between Sprottau and Sagan.

QUEI-TE, a city of China, of the second rank, in Quang-fi. N. lat. 28° 18'. E. long. 107° 4'.

QUELAINES, a town of France, in the department of the Mayenne; eight miles S. of Laval.

QUELEA, in Ornithology, a species of Emberiza; which feeds on grass.

QUELINES, in Geography, mountains of Mexico, between the provinces of Guaxaca and Chiapa.

QUELLINUS, ERASMUS, in Biography, called the Old, born at Antwerp in 1607, was a pupil of Rubens, and became a painter of history of very considerable reputation. He lived to the age of 71, and left a son John Erasmus Quellinus, who also became a painter, but who left the Flemish for the Venetian style of art, which he practised at Antwerp, his native city, till he arrived at the advanced age of 85, having been born in 1630.

QUELPAERT, in Geography, an island in the sea of Corea, on which a Dutch vessel, called the Sparrow-hawk, was wrecked in the year 1635, then subject to the king of Corea. No island presents a finer aspect; the middle of the island is occupied by a peak of about 800 toises, visible at the distance of about 18 or 20 leagues, and the land gradually slopes towards the sea, so that the inhabitants resemble an amphitheatre. It bores a great height seems to well cultivated. It bores, however, to a people who are forbidden to hold any intercourse with strangers, and who detain in slavery unfortunate persons who are wrecked on the coasts. Some Dutchmen of the Sparrow-hawk, after a captivity of eighteen years, during which they received many bollinades, found means to take away a bark, and to croas to Japan, from which they arrived at Batavia. N. lat. of the south point 30° 14'. E. long. 126° 35'.

QUELUSIA, in Botany, a name given by Vandelli to the beautiful Fuchsia coccinea, now so common in gardens. The author supposed it a new genus, and meant thus to honour a royal villa near Lisbon, called Queius, where he first saw this plant in bloom.

QUEM doom, in Law, an old writ which lay where a rent-charge, or other rent, which was not rent-service, was granted by fine holding of the grantor. If the tenant would not attorn, then the grantee might have bad this writ.

QUEMARY, in Geography, a town of Bootan; 20 miles E. of Beyhar.

QUEMENNES, a small island in the English channel, near the coast of France. N. lat. 48° 22'. W. long. 4° 48'.

QUEMI,
QUEMI, in Botany, a name used by some authors for the nigella, or geth.

QUEMIGNY, in Geography, a town of France, in the department of the Côte d'Or; nine miles S.W. of Dijon.

QUENALBA, a bay at the S. extremity of the island of Shetland. N. lat. 59° 49'. W. long. 1° 40'.

QUENON WATER-BARROW, in Rural Economy, a contrivance of the barrow kind, much employed in the neighbourhood of the little village of Quendon, in Essex, and from which it takes its name, for the purpose of conveying water, wash, and other liquid matters, to live flock of different kinds, as fattening cattle, logs, hordes, and other animals, as well as for some other uses. It is a simple and excellent invention for all such intentions, as very great facility is given to its motion by means of the wheels, and it is, on the whole, very compact in its general formation, which gives it a superiority over many other coattirances of a similar nature, as being capable of being put in motion, when full, without any great difficulty, or the application of any extraordinary power or force.

It is represented at figs. 6 and 7, in Plate Agriculture, shewing the methods of clearing quarries, pits, &c. from water. Fig. 6. explains the plan, in which a, a b, are the wheels, that fall on to the side-beams c d, c d, which are about four feet in length, and have their ends c, c, formed in such a manner as to serve for handles. E is an oval tub about thirty inches in depth, twenty-four in length, and eighteen in breadth, which is supported on the beams by two gudgeons, which play in semicircular boxes fixed near the ends of the beams: a crofs piece connects the two beams at f f, as does another at g g, to which two little curved pieces come, parallel to the form of the tube. The wheels are about four feet in height, and carry the tub suspended between them; for the gudgeons play almost over the two short axles, which figure into the beams. Two flight legs are fixed underneath the barrow at i i, to keep it in an upright position, but they are not at all essential, for the tub would remain in a state of equipoise between the wheels even without such aid. It must be noticed, that the tub is funk rather more than one-half below the gudgeons. Fig. 7. displays the profile of the vehicle; the dotted line signifies the size and place of the tub, which is made oval, for the purpose of confining the breadth between the wheels, so as to pass in at narrow door-ways, &c.

It is probable that it might be somewhat improved by having the axles hooked within, so as to bear upon two loops in one of the iron hoops, and by this means render the use of gudgeons and boxes wholly unnecessary. The tub would lift off and on, as easily as at present, while it would hang in a more precise and perfectly central manner. And still further, it would be a great convenience, if the upper part of the tub were furnished with a proper spout in the front, in order to pour water or other liquid materials through between the pales, &c. for the supplying of cattle, &c. This would be more easily accomplished, if the tub were allowed to swing in a free manner, as it might in that case be tilted up with great facility, so as to favour its being done, as shewn by the dotted line in fig. 2. About the little town noticed above, it is a great deal employed in carrying water for house use as well as that of farms. It is described in the Agricultural Magazine. Many other forms of water-barrows are made use of in different places. See WATER-BARROW.

QUELOG, or QUELENA, in Geography, a district of Africa, in the country of Sugumella, near mount Atlas.

QUENOY, Le, a town of France, in the department of the North; five miles N.N.W. of Lille.

QUENTIN, in Commerce, a small weight used in Germany; the ounce contains two lochs, or eight quentin.

QUENTIN, St., in Geography. See St. Quentin.

QUÉPO, a town of Mexico, in the province of Costa Rica, on the Eftrella; 70 miles S.S.W. of Carthag.

QUERA, a town of Italy, in the Trefian; 15 miles W. of Ceneda.

QUERALOS, a town of Spain, in Catalonia; 24 miles E. of Urgel.

QUERCIA, in Medicines. See Epialos.

QUERCEO, in Geography, a town of Etruria; nine miles S.S.W. of Volterra.

QUERCUS, in Botany, the Oak, an ancient Latin name, whose etymology has been considered as very uncertain, if not quite inexplicable. So it will in feem to those who looked no further than the Greek or Latin languages, for though some have deduced the word from xerós, a pig, because pigs feed on acorns, this explanation has not proved satisfactory. De Theis, on the authority of Lepelletier, has found a much better etymology for Quercus, in the Celtic quer, fine, and cuez, a tree; and this appellation is supposed to have been appropriated to the oak, not only for the beauty of the tree, but because it bore the fared plant, mifletz. This tree was also called in the Celtic tongue derys, whence came the word druid, or prief of the oak, and even the Greek δρυς, an oak, vulgarly suppos'd the original of Druid. (See DRUIDS.)—Linn. Gen. 495. Schreb. 496. Wild. Sp. Pl. v. 4. 423. Mart. Mill. Dict. v. 4. Sm. Fl. Brit. 1025. Ait. Hort. Kew. v. 5. 287. Julfl. 410. Tourn. t. 349. Lamanck Illust. t. 779. Gaertn. t. 37. (Hex; Tourn. t. 350. Suber; ejfd.)—Clados and order, Monocca Polyandra. Nat. Ord. Amentacese. Linn. Julfl.

Gen. Ch. Male, in a loose catkin, Cal. Periandria of one leaf, bell-shaped, membraneous, with about five small, sharp, often eleven segments. Cor. none. Stam. Filaments from four to ten, capillary, short; anthers large, of two round lobes.

Female, from a bud usually on the same tree, Cal. Periandria of one leaf, inferior, coriaceous, hemispherical, rough, entire, very small in the flower, permanent. Cor. none. Pet. Germen superior, ovate, very small; style simple, divided above into two to five segments, longer than the calyx: stigma simple, permanent. Pet. none. Seed an oval or roundish coriaceous nut, of one valve, smooth, attached by its scarred base to the bottom of the shortish, hardened, permanent, cup-like calyx.


Female, Calyx bell-shaped, coriaceous, entire, rough. Corolla none. Style one. Stigmas from two to five. Nut coriaceous, embraced at the base by the hardened calyx.

This genus, so tillant in its botanical characters, and food valuable for its economical uses, confidts, in the Species Plan tarum of Linnaeus, of no more than thirteen species. The discoveries of Thunberg, but especially those of American travellers, aided by the more accurate enquires of botanists, have fo greatly enriched the subject, that Wahlenberg, who has studied it well, enumerates seventy-six kinds of Quercus, and even these are not all that we have to describe. The importance of many species requires that they should all be particularized. Two or three of the East Indian ones, now for the first time described, offer some exceptions to the generic character of the calyx.

Section 1.—Adult leaves undivided and entire

in Abbot's Insects of Georgia, v. 2. 181. t. 91. Michaux Querc. n. 7. t. 12. (Q. virginiana, Ilicis longiore folio, fructu misimo ; Pluk. Amath. 180. t. 441. f. 7.) —Leaves membranaceous, linear-lanceolate, tapering at each end, entire, smooth, with a small point. Nut roundish.—Native of North America; in low swampy forests, near the sea-coast, from New J. rel. to Florida, flowering in May. Pursh. It is said by Mr. Aiton, on the authority of Knowleton's M.S. S., to have been cultivated in England by Mr. Fairchild, before the year 1723; and indeed, by the collection of Bulstrode, this tree appears to have been planted there much earlier, among those introduced by the first earl of Portland. It rives in its native country, as well as in England, to the height of fifty or sixty feet. The bark is smooth; the wood is good, and much in use, but of slow growth. Leaves scattered, on short stalks, four or five inches long, and not an inch wide, smooth, thin and plant, of a fine green, with a willow-like aspect, deciduous, their edges slightly waved. Acorn in pairs, roundish, scarcely above half an inch long, with a thin, tuberculated, or flesseled cup. The leaves of the young plant are somewhat angular, or toothed at each side. There is said to be a dwarf spragge variety, with shorter leaves. Michaux has figured in his vol. 1. t. 22. Michaux has two supposéd varieties, which other botanists esteem distinct species; see the following. The specific name, chosen by Linnaeus, ist not a good one, Quercus being the cork-tree.

2. Q. maritima. Ever-green Willow-leaved Oak. Willd. n. 2. Pursh n. 2. (Q. Phellos maritima ; Michaux Querc. n. 7. var. 2. t. 13. f. 3.) —Leaves coriaceous, elliptic-lanceolate, entire, smooth, with a small point. Nut roundish.—Found on the sea-coast of Virginia and Carolina, flowering in May and June. This differs from the foregoing in its low shrubby habit, and firm evergreen leaves, which are more elliptical in shape, and not above two inches long. The whole plant is from three to eight feet only in height. It appears by the accounts of authors to be distinct from the above-mentioned variety of Phellos.

3. Q. fericea. Silky Willow-leaved Oak. Willd. n. 3. Pursh n. 3. (Q. Phellos ; Sm. in Abb. Inf. v. 2. 101. t. 51. Q. Phellos pumila ; Michaux Querc. n. 7. var. 3. t. 13. f. 1. 2.) —Leaves lanceolate-oblong, someway waving; obtuse at the base; rather dilated upwards; silky beneath. Nut almost glabrous.—Native of the sea-coast, from Carolina to Florida, flowering in May. It is perhaps the most humble of the whole genus, scarcely ever exceeding two feet in height, and throwing out creeping feysons, whence it has obtained the name of the Running Oak. The filikens of the leaves beneath gives them a glaucous appearance.

4. Q. myrtifolia. Myrtle-leaved Oak. Willd. n. 4. Pursh n. 4. —Leaves coriaceous, oblong, entire, smooth, acute at each end."—Native of Carolina, according to Willdenow, who alone has noticed this species, and from whom Pursh has admitted it into his work. The branches are round, brown. Leaves an inch, or rather more, in length, coriaceous, evergreen, oblong, somewhat acute at the base; entire and slightly revolute at the margin; shining above; opaque, but smooth beneath; on short footstalks. The form of the leaves is much like the common broad-leaved myrtle. The flowers and fruit are unknown. Willd.


foil of sand upon clay, from Virginia to Florida and Missouri, flowering in May. Miller cultivated it at Chelsea in 1739, but we know not that this species is still preferred, or, at least, distinguished from Q. ilex, in our gardens or plantations. It is one of the most valuable American trees, growing to the height of forty or fifty feet, and extending its branches, in open situations, to a great extent; whence it serves, by its dense evergreen leaves, to shelter cattle from the summer's heat and winter's cold. The wood is the finest and most durable ship timber. It is felled towards the end of autumn, and kept three months before it is used. Michaux recommends this tree to the notice of the French and Spaniards, as likely to thrive well on the sandy coasts of the Mediterranean, and of the western ocean. By his account it succeeds best where there is a basis of clay under the sand, to fix the larger roots. The aspect of the leaves is not unlike our European Q. ilex, but they are, except when very young, more uniformly entire, and more shining; their under leaf is less densely pubescent; and their short footstalks, as well as the mid-rib, reddish. The foliage of feeding plants, and of vigorous young shoots, is, indeed, strongly toothed. The adult leaves are scarcely more than two inches long, somewhat oval, or obovate and bluntish, without any terminal bristle; silky in the spring; subfuscibly of a dark but shining green, and downy, with flary pubescence, beneath. The flowers are but four or five. Stalks of the fruit an inch long. Acorn cylindrical, an inch long, with a flesseled, but not ruptured or flesseled, cap. The acorns are said to be greedily devored by hogs, and several wild animals; and to afford an oil, which the fagaxes of Florida mix with their food.

6. Q. cinerea. Ash-coloured Silky-leaved Oak. Willd. n. 6. Ait. n. 3. Pursh n. 6. Michaux Querc. n. 8. t. 14. (Q. humilia ; Walt. Carol. 234. Q. Phellos b ; fericas ; Ait. Hort. Kew. ed. 1. v. 3. 354. Q. Phellos ; Linn. Sp. Pl. 1412.)—Leaves coriaceous, elliptic-lanceolate, revolute, entire, bluntish with a small point; clothed with flary down beneath. Fruit fesile. Nut nearly globose.—Native of dry barren situations, and pine forests, from Virginia to Georgia, flowering in May. Michaux says it springs up chiefly on land that, after having been cultivated, becomes abandoned on account of the bad quality of the soil. The form of the tree is unfightly, and its fize very variable, from four to twenty feet in height. The wood is of no use but for firing. Leaves longer than in the preceding; the young ones dilated at the top, with three points. Fruit nearly or quite fesile, almost globular, and not much above half an inch long.

7. Q. microphylla. Small-leaved Dwarf Oak. Willd. n. 7. Nee in Annal. Scient. Nat. v. 3. 264. Fitch. Mifs. Hesp. v. 1. 99. Willd. —Leaves lanceolate, pointed, entire, villous; downy beneath. Calyx of the fruit villous. Nut roundish.—Found by Louis Nee, on the hills of Aramboro, in New Spain. A shrub, from three to five feet high, with a smooth ash-coloured bark. Leaves on short flanks, scattered, numerous, from four to six lines long, scarcely two lines broad, veiny, revolute, wavy, pointed, reddish-grey; villous above; densly downy beneath; those about the extremities of the branches opposite. Stipulas awl-like, falling off at the elope of summer. Acorns in axillary pairs, about the ends of the branches, ovo-late, the size of a large pea, half covered by the villous cup, which is invected with unequal scales. Nee.

long."—Found by Lewis Nee, in the kingdom of Mexico, near Acapulco. A tree twenty-eight feet high, with alternate branches; the young ones somewhat furrowed, and clothed with brownish-red hairs. Leaves from five to seven inches long, an inch wide, scattered, on short flanks, rather coriaceous, smooth, vein, entire, wavy, pointed; reticulated and green above; yellowish beneath, with tufts of hairs, as big as a pin's head, in the forks of the veins. Acorns nearly fleshy in axillary pairs, the size of a hazelnut, downy, half covered by the hemispherical, greyish, villous cup, befitting with very thin scales. 

9. Q. glabra. Smooth-leaved Japanese Oak. Thumb. Jap. 175. Willd. n. 9. "Leaves lanceolate-oblong, pointed, smooth, with parallel veins."—Gathered by Thunberg in Japan. A tree, whose branches grow two or three together, slightly spreading, rugged and knotty. Leaves alternate, flaked, lanceolate-oblong, entire, pointed, with parallel ribs (veins); tapering at the base; smooth on both sides; shining above, yellowish beneath. Spikes of flowers either solitary, or two or three together, downy. Thunberg.

10. Q. concentrica. Concentric-leaved Oak. Loureir. Cochinch. 572. Willd. n. 10. "Leaves lanceolate-obovate, pointed, incurved, entire. Calyx lax, very short, furrowed concentrically."—Native of the lofty forests of Cochinchina. A large tree, whose wood is serviceable for various uses. Branches ascending. Leaves scattered, flaked, smooth on both sides. Acorns flaked, oblong-ovate, smooth, red, pointed, their cups short and lax, externally marked with five parallel circular furrows; see n. 27.

11. Q. molucca. Molucca Oak. Linn. Sp. Pl. 1412. Willd. n. 11. Rumph. Amboin. v. 3. 85. t. 56. "Leaves elliptic-lanceolate, entire, acute at each end, smooth. Nut roundish, furrowed."—Native of the Moluccas islands. A large and lofty tree, whose wood is hard and heavy, lasting long under water. Leaves fix or eight inches long and three broad, on short flanks, with eight or ten irregular lateral veins. Acorns short and roundish, furrowed in their upper part; the cup short, warty. By Rumphius's account, there seem to be more species than one comprehended under the chapter above cited, but he does not give us sufficient marks to define them specifically.

12. Q. spicata. Cluster-fruited Oak.—Leaves ellipticle lanceolate, taper-pointed, entire, smooth. Spikes axillary, foliate, dioecious. Fruit spiked, aggregate, ovate. Gathered by Dr. Francis Buchanan, in woods at Snubb, in Upper Napa, flowering in May, 1802. This is a tree of vast dimensions, whose wood is useful, though inferior in quality to that of Q. annulata, n. 22. The younger branches are angular, clothed with very minute green pubescence. Leaves alternate, flaked, of a broad lanceolate, or elliptical figure, with a taper point, entire throughout, fix or seven inches long, and two and a half wide; bright green, smooth and shining above; paler, opaque, but scarcely pubescent, beneath; furnished with numerous, parallel, transverse veins. Footflakes not an inch long, deprecised. Stipulas deciduous. Flowers in long, linear, downy, pale, straight, foliate, axial spikes; the male with about eight stamens, much longer than the calyx, and a roundish rudiment of a germ in the centre; females on a separate tree, crowded three together in binate groups in each spike. Acorns edible, but not very good, the size and shape of a large filbert, even, pointed, dark brown; their cups short, feebly. The original names of Nepaul, or Nawars, know this tree by the name of Guly Sophia, or Pacyvinga; their Hindi conquerors, the Parbatties, call it Arculata.

13. Q. tribuloides. Caltrap-fruiting Oak.—Leaves ovate-lanceolate, taper-pointed, entire, smooth. Spikes aggregated. Calyx of the fruit spiny, covering the nut.—Diff. covered by the same leafy cohort as the preceding, in the forests of Upper Nepaul, flowering and fruiting at various seasons. A tree with smooth branches. Leaves on short flanks, lanceolate, more or less ovate, somewhat unequal at the base, about four inches long, and one and a half broad, rigid and rather coriaceous, with irregular, dilated, slightly curving veins; the upper surface polished; the under paler and opaque. Flowers monocious, in slender, downy, clustered, axillary or terminal, pendulous spikes, the male spikes most numerous. Stamens about eight, with a dotted central disk. Acorns spiked, scattered, ovate, smooth, obliquely pointed, about half an inch long, entirely concealed in the greatly enlarged calyx, which is downy, globose, and armed with very numerous, rigid, prominent, sharp thorns, a quarter of an inch, or more, in length, spreading in every direction. This species is called Cattum, or Catungu, in the Parbutty language; Shingali, or Cata Shingali, by the Nawars. Its great peculiarity consists in the acorns, which are capable, being entirely enclosed in a strongly muretated calyx, or globose cup, which approaches the nature of the chestnut, Fagus Caffiana, and in some of our specimens seems even to split into two or three valves. The flowers, however, agree with Quercus, to which genus Dr. Buchanan referred this remarkable plant. On one tree he observed the flowers to be all female.

14. Q. laurifolia. Laurel-leaved Oak. Willd. n. 12. Art. n. 4. Pursh n. 8. Michaux Querc. n. 10. t. 17, 18. —Leaves ovate, entire, smooth, nearly fleshy; tapering at the base. Nut roundish, even.—Native of shady forests, and the sea-coast, in Georgia and South Carolina, flowering in May. This is sometimes called the Swamp Willow, and was first brought alive to England, by the late Mr. Fraher, 1786. It rises to the height of fifty or sixty feet. Michaux speaks of the wood as of a good quality, but inferior on the whole to that of our fifth species, Q. virgata. The leaves are crowded about the ends of the branches, decussate, about four inches long, usually acute, but sometimes, as in Michaux's t. 18, remarkably obtuse. Acorns solitary, nearly fleshy, almost globose, with a fecal cup.

15. Q. imbricaria. Shingle Oak. Willd. n. 13. Art. n. 5. Pursh n. 7. Michaux Querc. n. 9. t. 15, 16.—Leaves elliptic-oblong, acute at each end, entire, almost fleshy; downy beneath. Nut nearly globose.—Native of the banks of rivers among the Alleghany mountains, and in the countries to the west, rarely to the east of those mountains, flowering in May and June. Brought to England in 1786, by Mr. Fraher. The leaves are twice the size of the lilac, acute, but not contracted, at their base, and downy on the under side. Acorns much like the last-described. This tree is forty or fifty feet high. Its wood is chiefly used by the French settlers in the Illinois country, for making boards to cover houses, whence the appellation of Q. imbricaria in Michaux, and of Shingle Oak among the English Americans. For although the scales of the cup are rather larger than those of Q. laurifolia, the specific name does not allude to that circumstance.

16. Q. ellipica. Oval-leaved Mexican Oak. Willd. n. 14. Nee in Annal. Scient. Nat. v. 3. 278. Fitch. Misc. Hftp. v. 1. 117. "Leaves elliptical, entire, coriaceous, nearly fleshy; rounded at each end; roughish beneath. Gathered by Lewis Nee, but without flowers or fruits, in the kingdom of Mexico, by the road from Ixmiuqilpan to Cimapan, as well as between Tixtala and the river Azul. The trunk is thick, twelve feet high, with a grey bark. Branches horizontal; the smaller shoots erect;
all very leafy. Leaves three inches long, and one and a
half broad, shortly ovate; smooth above; roughish and
veiny beneath, the veins forked. Footstalks thick and very
short. 

175. Banks le; Kämpf. t. 17. Wild. n. 11. (Kas no ki Kämpf. Amon. 816.)—Leaves obovate, pointed; serrated
towards the extremity; glaucous beneath. Nut roundish.
—Gathered near Nagasaki, in Japan, by professor Thunberg,
to whom we are obliged for a specimen. He describes it as
a very large tree, whose branches are somewhat umbelate,
erecet, round, purple, smooth, except some prominent
white points. The leaves are alternate, about three inches
long, and near two broad, with a blunt projecting point; their
upper surface smooth and polished; the under covered with
a fine glaucous mealy, and marked with prominent,
straight, parallel, but rather dilated, obliquely transverse
veins; the margin differently serrated upwards. Footstalks
about half an inch long, purple. Flowers axillary. Acorns,
by Kämpfer's figure, axillary, often in pairs, of a roundish
humid shape, pointed, not an inch long, their cups short,
seemingly marked with concentric lines; their flarks simple,
short and thick.

Hilp. v. i. 103.—Leaves obovate-oblong, coriaceous, entire;
flaking down; downy beneath; somewhat emarginate at the
base. Fruit racemosum. —Found by Louis Nee, in the kingdom
of Mexico, between Chilpancingo and Tixtala, and about
the river Azul. This is an elegant tree, twenty feet, or
more, in height. Trunk thick, with a dark-coloured bark
full of fissures. Branches horizontal; younger ones fur-
rowed, and dotted with white. Leaves fix or eight inches
long, and three broad, ovate, rigid; sometimes emarginate
at the base; green and shining above; downy beneath, with
the larger veins prominent, and the smaller reticulated.
Footstalks thick, a line in length. Stipulas crisped, downy,
deciduous. Female style large, axillary, two inches long;
the lower ones alternate, upper opposite. Acorns
ovate, half covered by their semilunar cup, which is the
size of the seed of Cicer aritinum, its scales scarcely at all
imbricated. Nee.

Hilp. v. i. 105.—Leaves obovate, entire, shining; some-
what heart-shaped at the base; downy and yellow beneath.
—Found in Mexico by the fame celebrated traveller and
botanist. This agrees with the preceding in its mode of
growth, and fruitification, intimating that it may be thought
a variety; yet the leaves are very different. They are of a
larger size, broader towards the end, and contracted to-
wards the footstalk, as well as more deeply emarginate at
the base; and their under side is clothed with ochre yellow
pubescence.

20. Q. semecarpifolia. Marking-nut-leaved Oak.—Leaves
obovate, obtuse, coriaceous, entire; heart-shaped at the
base; downy beneath; the young ones with spinous teeth.
—Gathered by Dr. F. Buchanan, on the banks of the torrents
in Upper Nepal, where its Parbutte appellation is Caffir,
and its Nawar name Ghiris. This is a middle-sized tree, with
angular branches, clothed when young with tawny down.
Leaves obovate, alternate, on short thick stalks, obovate-
oblung, four or five inches in length, and two in breadth;
more or less heart-shaped at the base; their upper surface
smooth and shining; the under opaque, clothed with rusty
down, and furnished with numerous, irregular, rather dif-
tant, transverse, prominent veins; their margin entire, finely
wavy. The extremity is usually rounded and obtuse, some-
times abrupt, sometimes tipped with a little spine. On young
branches the leaves are serrated with strong spines, or even
finnate, and clothed on both sides with rusty down. Stipulas
in pairs, awl-shaped, erect, permanent, as long as the foot-
stalks. Dr. Buchanan did not observe the flowers or fruit.
The aspect of the adult leaves is much like those of Semicarpus
Anacardium, or some of the entire-leaved species of Ficus.
Section 2. —Leaves more or less tomentose or serrated.


22. Q. annulata. Ring-cupped Oak.—Leaves obovate,
pointed; serrated in their upper half; somewhat glaucous
and downy beneath. Fruit spined. Nut oblong. Calyx fur-
rowed concentrically. —Gathered by Dr. Buchanan, at var-
ious places in Upper Nepal, bearing fruit, in December
1802. A very large tree, whose wood is excellent; the
branches two or three together, smooth. Leaves evergreen,
rigid, exactly like those of the last species, but somewhat
filky beneath, and less glaucous; the young ones very filky.
Stipulas linear, hairy, longer than the footstalks, deciduous.
Male flowers in pendulous, hairy, yellowish, shortish spikes,
springing from buds below the leaves, whose scales are
imbricated in five rows; female from three to six, in solitary,
axillary, upright, flaked, smooth spikes, about the length
of the footstalks. Calyx of the female flowers globose,
smaller than hemipede, composed of several concentric
imbricated layers, of which the outermost is smooth and
notched, the rest downy and entire. Germen globose. Style
very short and thick. Stigma three, obtuse. Acorns
quite suffil on the common flower-stalk. Cup rather smaller
than that of our British oaks, entire and even at the edge,
composed of seven or eight concentric, annular, imbricated,
crenate scales, externally filky. Nut ovate, acute, smooth
and even, twice as long as the cup. The Parbutties call this
tree Phullat; the Nawar Gifi, or Pas Iiringeli.

We find great reason to think that it may be, as Dr. Bu-
chanan first published, the same species with Thunberg's glauca
latt described. The leaves of his specimens flew a flight
degree of pubescence about the veins, but have not the
minute filikiness of ours. The greatest and most effential dif-
ference, if Kämpfer be as correct as usual, consists in the
female inflorescence. He delineates the acorns of glauca on
short, filike, axillary flaks, either solitary or in pairs; and
Thunberg describes the flowers as axillary. In our plant
the female flowers are indeed axillary, but they compose a
filked spike, and neither they nor the acorns have any par-
tial flaks. Such differences are found between other spe-
cies of Oaks, and prove effential and invariable. We there-
fore cannot but, for the present at least, rely on Kämpfer's
known fidelity, and propose our Q. annulata as a distinct
species.

23. Q. lamellosa. Many-cupped Oak.—Leaves elliptic-
oblung, pointed, serrated, many-veined; glaucous and fore-
most below. Nut roundish. Calyx of many concentric entire
layers, as long as the nut. —Discovered by Dr. Buchanan,
in the more remote woods of Nepal, bearing fruit in De-
cember 1802. In the Nawar language it is called Tuppsujha.
The tree is lofty, with smooth bluntly-angled branches.
Leaves alternate, six inches in length and two in breadth.
QUERCUS.

eelliptic-oblong, rigid, taper-pointed, sharply ferrated; smooth and green above; glaucous and often finely downy beneath, with innumerable, prominent, crowded, straight, parallel, mostly opposite, obliquely transverse veins; the apex and fize of the leaves much resembling Dillenia indica. 

Footstalks an inch and half long, tumid at the base. 

Stipulas deciduous. Female flowers in short axillary spikes. 

Acorns ovate, pointed, the fize of cheftsnuts, each completely enveloped and concealed by the large, globular, downy cup, which is as big as a small apple, and consists of eight or nine distinct, concentric, entire, imbricated layers, much more deeply separated than the rings of Q. annulata. An approach towards the genus Fagus, or Callaenas of sane authors, may be observed, as Dr. Buchanan figures, in this species, which is nevertheless a genuine Quercus, and far less doubtful than our tribuloides, n. 13. It proves however that the mere elongation of the acorn, beyond the cup, is not an indispensable character of the present genus. See also tomentosa, n. 42.

28. Q. diversifolia. Various-leaved Mexican Oak. Willd. n. 21. Nee in Annal. Scient. n. 3. 270. Fifth. Mfie. Hisp. v. 1. 107. Willd.—Leaves ovate, undivided or deeply toothed; yellow and downy beneath. Fruit spikcd, globule.—Found by Louis Nee, between the villages of Chalma and Santa Rofa in New Spain. A forest, from ten to fourteen feet high; its trunk seldorn straight; the bark cracked, dark-coloured; the branches alternate. Leaves either an inch and half long, and undivided, or two inches and a half, and deeply toothed; smooth and shining above; downy, and dull yellow, beneath. Footstalks hardly a line in length. Stipulas oblong, reddish, membranous, contracted at the base, deciduous. Acorns four or five, fesile, on a thread-shaped axillary flalk, two inches long. Cup the size and fhape of a pea, covered with scales. Nuts scarcely projecting above a line beyond the cup. Nee. The fruit, being fesile, is evidently spikcd, not, as the authors quoted term it, racemose.


Pikenet’s t. 196. f. 5. cited with doubt by Willdenow and Purh, appears to belong, as Linnens thought, to his own Hippomane fiponif. The fhape of the leaves cefainly does not agree with the above description, though perfectly answerable to Plumer’s figure of this Hippomane, which is Sapum ilicifolium of Willdenow, Sp. Pl. v. 4. 573, who there copies the fame fonym from Linnens, without any mark of uncertainty.

30. Q. gramunifia. Holly-leaved Montpellier Oak. Linn. Sp. Pl. 1415. Willd. n. 23. Ait. n. 6. (He foniis rotundifolius et pinpointis, e luco gramunio; Magn. Monsp. 140.)—Leaves roundish-elliptical, nearly fesile, undulate, with deep fimpan divaricate teeth; densely downy beneath; somewhat heart-shaped at the base.—Native of the wood of Gramont, near Montpellier, and of Spain. Cultivated in England in 1730. It blossoms in June. This is rather a small fragging tree, with numerous round grey branches, downy when young. Leaves evergreen, scarcely an inch long.
QUERCUS.

long, rigid, broadly elliptical, often nearly orbicular, very much undulated at the margin, their deep brown spinosous teeth pointing every way; the upper surface dark green, rather glaucous, besprinkled with minute hairy hairs; the under densely clothed with white entangled down. We have seen neither flowers nor fruit. Willdenow appears mistaken in discarding the synonymy of Magnol, which answers extremely well to the Linnean specimes; though indeed the author speaks of his plant as a variety of \textit{Q. Ilex}. It is, nevertheless, true that Linnæus confounded herewith a plant from Magnol's herbarium, which is not distinct from \textit{Q. Ilex}.


Native of several places in the neighbourhood of Mount Athos, according to professor Desfontaines, from whom we have a wild specimen. It flowers in May. This is a large and handsome evergreen tree, whose trunk is from twenty to thirty feet high; the wood hard, compact, and very useful; the bark even, not corky, though full of fissures; branches downy. Footstalks a quarter of an inch long, downy. Leaves various in shape, but more or less elliptical, an inch or half an inch long; either quite entire, or serrated with small spiny teeth; their upper surface, at least when young, besprinkled with minute hairy hairs; the under always very white and denely downy. Male flowers in copious, long, lax, pendulous spikes, with usually seven filaments; female on the same tree, axillary, solitary or aggregate. \textit{Acorus} cylindrical, an inch and half or two inches long, half an inch in diameter, caved and very palpable, either raw or roasted. Cup hemispherical, covered with numerous, obtuse, downy, closely imbricated scales.

32. \textit{Q. Ilex}. Common Evergreen Oak, or Holm Oak. Linn. Sp. Pl. 1412. Willd. n. 25. Ait. n. 7.—Leaves ovate-oblong, acute, coriaceous; entire or serrated; hoary beneath. Bark even. Nut ovate. The varieties are: \textit{s}, with lanceolate entire leaves; \textit{Smilax} Dalech; Bauch. Hill. v. 1. part 2. 101. Suber fecundus; Matth. Valgr. v. 1. 188, as to the figure; \beta, with lanceolate ferrated leaves; \iota; Matth. Valgr. v. 1. 186. Duham. Arb. v. 1. t. 123: \gamma, with rounder, less rigid, and more or less ferrated leaves; Phenodryus; Matth. Valgr. v. 1. 189, as to the figure. Ilex n. 3; Duham. Arb. v. 1. t. 124. This species occurs in various parts of the south of Europe, and north of Africa, and is hard, as well as evergreen, with us, thriving particularly near the sea, though of slow growth, flowering in May and June. It usually forms a large bushy tree, but occasionally rises with a straight naked trunk, and round head, to a great height. The wood is hard and heavy, valuable for many purposes. The French use it for pulleys in the navy. The bark is hard and even, not corky. Leaves various in shape and size; dark green, convex, and quite smooth above; hoary or downy beneath; their edges either revolute and entire, or irregularly notched and serrated. Footstalks half an inch long, downy. Acorns usually two, on an axillary downy stalk which is longer than the footstalk, ovate, hardly an inch long, with a scaly downy cup. They are eaten by hogs, but are very different in shape and quality from those of the leaf-deprived species. So many varieties, or species, nearly corresponding with these two, are mentioned by authors, that it is difficult to understand them. The subject requires, and well deserves, a practical investigation. Lamarck, under the article Chêne, in his dictionary, mentions several kinds, which he knew but imperfectly, and which we have no means of elucidating further,

so that we dare not adopt, or attempt to reduce them to order.

33. \textit{Q. Suber}. Cork Tree. Linn. Sp. Pl. 1413. Willd. n. 26. Ait. n. 8. Hunter's Eucl. Sylv. 362, with a plate; Suber; Camar. Epit. 115. S. primus; Matth. Valgr. v. 1. 187. S. latifolium, perpetuò virens: Duham. Arb. v. 2. 291. t. 80. S. latifolium; Ger. Em. 1547, the middle figure only. —Leaves ovate-oblong, blunt, coriaceous; entire or sharply serrated; downy beneath. Bark cracked, fuscous. Native of the south of Europe, and north of Africa. Duhamel says it can hardly bear the climate of the north of France. It lives however in our English gardens, where it has been kept more than a century. The bark is remarkable for a thick fyspous cortex, yielding the well-known substance cork. The leaves much resemble the broad variety of \textit{Q. Ilex}, nor do the acorns greatly differ from those of that tree. We have not been able to ascertain what authors mean by the \textit{Suber} angustifolium non ferratum, the figure of which, Matth. Valgr. v. 1. 188. Duham. Arb. v. 2. t. 81, we have cited as our first variety of \textit{Ilex}. We should suspect the \textit{Suber} itself to be altogether a variety of \textit{Ilex}, differing only in the bark; and that there might be a broad and a narrow-leaved variety of each; were not the dwarf tufted fuscous habit of the Cork Tree, on the sandy plains of Italy, Spain, &c. fo peculiar. Yet this possibly may, as well as the nature of the bark, be owing to the soil, for in strong ground the cork, according to Duhamel, degenerates. Willdenow says "the leaves of \textit{Q. Suber} are a little elongated at the base, running down into the footstalk, which is not the case with \textit{Ilex}!" but this character seems feebly permanent.

34. \textit{Q. coccifera}. Kermes Oak. Linn. Sp. Pl. 1413. Willd. n. 27. Ait. n. 9. (\textit{Ilex coccifera}; Camar. Epit. 774. I. aculeata coccediandifera; Garid. Aix. 245. t. 53. Niefoile in Mem. de l'Acad. des Sciences for 1714. 435. t. 17. 18. I. coccigera; Ger. Em. 1542.)—Leaves elliptic-oblong, rigid, smooth on both sides, with spreading, brylly, spinous teeth. Nut ovate. Calyx with spreading pointed scales. Native of the south of Europe, and the Levant, flowering in the spring. This is a bushy evergreen shrub, celebrated for producing the kermes, a valuable article of dyeing, before the introduction of cochineal, and which afforded the color kermesinus, or crimson. The kermes is an insect, of the genus \textit{Coccus}, which sticks to the branches, in the form of a red ball, the size of a pea. It is now out of use among dyers, and is only used by French apothecaries. The leaves of this shrub are, at most, but half the size of the leaf, though they vary much in magnitude as well as figure. They are diffuselyth with their rigidity, smoothness on both sides, and their prominent needle-like marginal prickles. The scales of the mature calyx are also much more elongated and prominent than in \textit{Ilex} or \textit{Suber}, and of an angular awl-shaped figure.

35. \textit{Q. Pseudo-coccifera}. Ballard Kermes Oak. Desfont. Atlant. v. 2. 34. Willd. n. 28.—Leaves elliptic-oblong, rigid, smooth on both sides, with spinous ferratures. Nut ovate. Calyx with flat, slightly spreading, scales. Observed by Desfontaines at Algiers and about Mount Athos. At Tunis it is called the "meal-bearing oak," probably from the use of the acorns as food. This is a tree, from fifteen to twenty feet high, with round branches, clothed with woolly down when young. The leaves are twice or thrice as large as those of \textit{Q. coccifera}, thicker and less wavy, with much smaller and shorter spinous ferratures, rather than teeth. Calyx clothed with numerous, flat, short, slightly spreading scales. Nut ovate, pointed. Willdenow, not having seen a specimen, has misunderstood the
the nature of the calyx, and has in other respects altered Desfontaines' specific character for the wood.

36. Q. rigidia. Rigid-leaved Oak. Willd. n. 29.—(Leaves coarsely glandulose, nucem cylindracea, nunc subrotundata, cupulata echinata; Tourn. Cor. 49.)—“Leaves oblong, undivided, with spiny ferratures, smooth; glaucous beneath; heart-shaped at the base. Footstalks bearded at the summit. Scales of the calyx of the fruit rigid, spreading.”—Native of the coast of Caramania. Willdenow.

A pretty species, sufficiently distinct from its allies. Branches pale brown, dotted. Leaves oblong, an inch or rather more in length, rigid, with spiny ferratures; deep green and shining above; glaucous beneath; cordate at the base. Footstalks very short, smooth, except at the top, where a line of brownish hairs, on each side, runs up the midrib. Calyx of the fruit feathery, becket with rigid, woody, lanceolate, spreading scales. Willd.

A specimen before us, gathered by the late Dr. Broussonet at Algiers, answers precisely to this description, especially in the curious character of the hairy lines, running a little way up the midrib of the leaf; but the foliage is equally green and shining on both sides. The calyx resembles that of coccorea, but its inner scales are longer, and more spreading.

37. Q. rotundifolia. Round-leaved Spanish Oak. Lamarck Dict. v. t. 723. Willd. n. 30.—“Leaves obovate-oblong, abrupt, with spiny teeth; heart-shaped at the base; smoothish above; downy beneath.”—Native of Spain. Seen by Lamarck, in a young state, in the gardens of Madrid. The branches are round and downy. Leaves stalked, an inch or more in length; glaucous-grey, and not quite smooth, above; white and cottony beneath. The acorns are said to be large and long, edible like chestnuts. This description is not applicable, on the whole, to our n. 31, Q. Ballota.

38. Q. humilis. Dwarf Portuguese Oak. Lamarck Dict. v. t. 719. Willd. n. 31. Ger. Em. 1340. (Q. pedem vix superans; Bauh. Pin. 420. Robur 7; Chf. Hift. v. t. 19.)—Leaves obovate, with spiny ferratures; heart-shaped at the base; downy beneath. Calyx of the fruit flattened. Nut oblong.—Found by Cluibus in barren sandy ground near Lisbon, very abundantly. The whole plant is rarely more than a foot high when wild; though Lamarck says it becomes twice or thrice as tall by culture. The young branches are downy. Leaves an inch, or inch and half long, on short footstalks; smooth and shining above; downy and hoary beneath; their larger veins straight and parallel. The acorns are described as more bitter than our common oak, their form oblong, their cups remarkably short and flattened.

39. Q. luftanica. Portuguese Gall Oak. Lamarck Dict. v. t. 719. Willd. n. 32. (Q. valentina; Cavani. Ic. v. 2. 25. t. 129? Robur 4; Chf. Hift. v. t. 18, and R. 5; ibid. 19. Gallina five Robur majus; Ger. Em. 1348, and G. minor; ibid. 1349.)—“Leaves elliptical, with deep pointed ferratures; downy beneath. Fruit racemose. Calyx hemispherical. Nut oblong.”—Native of Portugal, and perhaps Spain. Lamarck says this species confounds several varieties, all very low thorns, subject to bear gall; their branches copious and slender, they leaves small, intermediate in form between the evergreen and the ordinary oaks of Europe. Willdenow describes the leaves an inch in length, oblong, obtuse, rigid; their ferratures somewhat pointed; the upper surface polished and smooth; the under hoary with flender, tawny, crowded hairs. Footstalks short. Fruit racemose, or rather, as we should imagine, spiket. He adds that the figure of Cavanilles fearfully answers to the plant in question; and indeed that author describes his as a lofty tree, taller than Q. fies, with deciduous leaves, and large, solitary acorns. We have seen no specimen.

40. Q. infulata. Oriental Gall Oak. Olivier’s Travels, English edition, v. 2. 42. t. 1. 145. Willd. n. 33.—Leaves ovate-oblong, very smooth on both sides, deeply toothed, somewhat minutated, deciduous. Fruit feathery. Calyx telfilled. Nut elongated, nearly cylindrical.—This oak, according to Olivier, is scattered throughout all Asia Minor, from the Bosphorus as far as Syria, and from the coasts of the Archipelago, as far as the frontiers of Persia. It seldom attains the height of six feet, and the stem is crooked, with the habit of a thorn rather than a tree. The leaves are an inch or inch and half long, deciduous, bright green, smooth on both sides, but paler beneath; their ferratures deep and broad, not acutely pointed. Fruit solitary, nearly feathery. Cup slightly downy, its scales not very distinct. Acorns two or three times longer than the cup, smooth, nearly cylindrical. The galls produced on the young branches of this oak, from the puncture of a species of Diplopterys, are preferred to all others for dying, and are a great article of the Levant trade. (See Galls.) Olivier observes that the plant bears a number of different galls, besides the above, which are neglected, as useless.

41. Q. muraonata. Pointed-toothed Mexican Oak. Willd. n. 34. (Q. caltanea; Nee in Annal. Scient. Nat. v. 3. 270. Fitch. Mfle. Hift. v. t. 114. Willd.)—“Leaves obovate-ovate, with tooth-like notches; densely downy beneath. Fruit racemose. Nut globose, nearly covered by the calyx.”—Native of New Spain, in the road from Mexico to Acapulco, beyond the river Mecacla. A tree, twenty feet high, with a straight trunk, covered with a brittle dark-coloured bark. Branches erect, alternate, smooth, much sub-divided. Leaves three inches long, and one broad, acute; abrupt and heart-shaped at the base, their ferratures awned; the upper surface green and smooth; the under clothed with fine yellow down. Footstalks two lines long. Stipula none. Nee.

42. Q. tomentosa. Downy Mexican Oak. Willd. n. 35. (Q. peduncularis; Nee in Annal. Scient. Nat. v. 3. 270. Fitch. Mfle. Hift. v. t. 106. Willd.)—“Leaves obovate-ovate, with tooth-like notches; densely downy beneath. Fruit racemose. Nut globose, nearly covered by the calyx.”—Native of New Spain, in the road from Mexico to Acapulco, beyond the river Mecacla. A tree, twenty feet high, with an upright trunk, and grey brittle bark. Branches numerous, alternate, clothed with dense reddish wool. Leaves five inches long, hardly two wide, crowded, obtuse at the base; pointed at the end; bordered with tooth-like notches; green and smoothish above; downy; with prominent veins, beneath. Footstalks downy, very short. Female flowers on an axillary solitary stalk, three or four inches long. Acorns but little bigger than pepper-corons, each almost entirely concealed in its scaly, downy, reddish cup. Nee. This species agrees with ours thirteenth, tribuloides, in having its acorn concealed by the cup. The fruit is described, by the authors we are obliged to copy, as race-mose. We have seen no specimens, but analogy would induce us to suppose it rather spiket.

rowed, villous. *Leaves* alternate, from five to seven inches long, and three broad; green and shining above; more or less downy, and flesh-coloured, or reddish-brown, beneath; the margin undulated and crenate, the notches rounded; their edges turned towards the point of the leaf. Fruit supported by a very short common stalk. *Calyx* hemispherical, the size of Chick peas. *Cicer aritinum*; its scales acute at the point. Nut but little larger than the calyx. Plukenet's t. 54. f. 53, in some measure resembles the species before us, but is said to have a large fruit, and is cited by authors as *Q. Primus* Nee.


45. *Q. rugosa*. Rugged Mexican Oak. Willd. n. 38. Nee in Annal. Scient. Nat. v. 3. 275. Fitch. Misc. Hilp. v. 1. 112. Willd. "Leaves obvate-oblong, coriaceous, rugose; toothed towards the end; heart-shaped at the base; downy and rufy beneath."—Native of the woods of Huitzilqualla and Ocuila, in the way from Mexico to Santo Cristo de Chalma. A middle-sized tree, having numerous, alternate, round, grey branches, rough with minute prominent points. *Leaves* three inches in length, hardly two in breadth, thick and coriaceous; rugged, green and shining on the upper side; brown and downy at the back; heart-shaped at the base; the margin toothed from the middle to the extreme. *Footstalks* two lines long, thickened at their base. *Female flowers* in scaly axillary culls. Nee.

46. *Q. macrophylla*. Large-leaved Mexican Oak. Willd. n. 39. Nee in Annal. Scient. Nat. v. 3. 274. Fitch. Misc. Hilp. v. 1. 111. Willd. "Leaves obovate-oblong, coriaceous, rugose; toothed towards the end; heart-shaped at the base; downy beneath. Fruit spiky."—Found by Louis Nee, the discoverer likewise of the five preceding species, in the districts of Chilpanic and La Curva, and on the mountains of Quirapu, in New Spain. This is a tree, thirty feet high, with a stout upright *trunk*, and dense *bark*. The principal *branches* are horizontal; the *ruff* upright, furrowed when young. *Leaves* a foot long, and seven or eight inches broad; rounded at the end; gradually tapering down to the emarginate, or heart-shaped, base, where they measure only four lines across; their upper surface green and shining; the under yellowish, clothed with very minute down; the margin *crenate* and wavy. *Footstalks* very short and thick. *Female flowers* feathery on a common *stalk*, and encompassed with downy *bracteae*. Nee.


This is one of the tallest trees produced in the southern parts of the United States, and remarkable for the beauty of its form, as well as the large size of its *acorns*, which are plentiful and sweet, a delicious and beneficial food for hogs and other wild animals. The *wood* is excellent, much used for making wheel-carriages, and yet so readily split as to serve for balk-work and brooms. The *leaves* are fixed inches, or more, in length, and three broad; silky in the spring; smooth and glaucous in summer; sometimes very downy on old trees. *Footstalks* an inch long. *Stamens* five to ten. *Acorns* in inch and half long; ovate; their cups shallow, covered with numerous closely-imbricated scales. Michaux says the *bark* is whitish, peeling off in long strips.

48. "*Q. Chinquipuin*. Chinquipuin, or Dwarf Chefuneat Oak. Pursh n. 34. (Q. primoides; Willd. n. 41. *Q. Primus*, var. 4. pululちは; Michaux Querc. n. 5. t. 9. f. 1. *Q. Primus* Chinquipuin; Michaux Arb. v. 2. 65. t. 10. good. Pursh.)—Leaves on short stalks, obovate, smooth; glaucous beneath; tapering at the base; with nearly equal, dilated, acute, callous-tipped, tooth-like *ferrugineae*. *Calyx* of the fruit hemispherical. Nut ovate.—Found on dry mountainous lands, from Pennsylvania to Carolina, flowering in May, when, according to Mr. Pursh, it is highly ornamental. This is a humble *florib*, not above three or four feet high. The young leaves are whitish and downy beneath; the adult ones smooth and glaucous, scarcely above one-third the size of the preceding. *Female flowers*, according to Michaux, small, two or three together, on a short, solitary, axillary *flattt*. *Acorns* of a middling size, with a thin, nearly hemispherical, cup.

49. *Q. montana*. Rock Chefueat Oak. Willd. n. 42. Pursh n. 32. (Q. Primus; Sm. in Abbt's Inf. v. 2. 163. t. 82. *Q. Primus*, var. 2. monticola; Michaux Querc. n. 5. t. 7.)—Leaves on shortish stalks, obovate, acute; downy and white beneath; with nearly equal, dilated, short, blunt, callous-tipped tooth-like *ferrugineae*. Fruit in pairs, on short stalks. *Calyx* hemispherical, with rugged scales. Nut oblong-ovate.—Found abundantly, in rocky situations, on the mountains of North America, from New England to Carolina, flowering in May. Michaux tugs that this species would be well worth cultivating in Europe. The tree rises to the height of sixty feet; the *wood* is tough and very useful, the *bark* excellent for tanning. It differs from *Q. Primus*, n. 47, with which it has been confounded, in the confluent white downiness of the under side of the *leaves*, which are much smaller and less dilated upward. The *acorns* moreover are but half the size of that species, and more oblong, two together on a very short stalk.

50. *Q. bicolor*. Swamp White Oak. Willd. n. 43. Pursh n. 31. (Q. Primus, var. 5. tomentosa; Michaux Querc. n. 5. t. 9. f. 2. *Q. Primus* dicolor; Michaux Arb. v. 2. 46. t. 6. Pursh.)—Leaves nearly obovate, obovate; downy and white beneath; with very broad, unequal, obtuse, callous-tipped, lobe-like teeth. Fruit in pairs, on long bristle-pointed stalks. *Calyx* hemispherical. Nut oblong-ovate.—Native of low wet woods, from Pennsylvania to Carolina, flowering in May. Pursh. It grows to a very large tree. The *leaves* have extremely broad shallow teeth, or, as they might be called, lobes, approaching to the figure of our common English Oak leaves; their under side white and very downy. The *acorns* are sweet and edible, like most of the *Primus* tribe. Willdenow says the teeth are occasionally variable in size, one or two of them being sometimes remarkably elongated; and that the base of the *leaf* is more entire than in the foregoing.

51. *Q. Calflarea*. Yellow Oak. Willd. n. 44. Pursh n. 33. (Q. Primus, var. 5. escunina; Michaux Querc. n. 5. t. 8.)
t. 8.)—Leaves on long footstalks, oblong-lanceolate, pointed; somewhat downy beneath; with numerous, nearly equal, dilated, acute, callous-tipped, tooth-like serratures. Calyx hemispherical. Nut roundish-ovate.—Found in the Alleghany mountains, and on the banks of the Delaware, flowering in May. Pursh. Michaux says it occurs in all the fertile countries to the west of those mountains; and as the temperature of that climate agrees with the north of Europe, the tree in question would be well worth trying here. The wood is excellent; bark very serviceable in tanning; and the acorns sweet. The tree is large and handsome, of seventy or eighty feet high. Leaves much like those of our Sweet Chestnut in form, but glaucous and often downy beneath. Acorns much rounder than in any of the four preceding, and shorter in proportion to the cup. These Chestnut Oaks, Primus and its allies, seem not to have as yet attracted the notice of European cultivators, perhaps from their having been improperly confounded by botanists. The above accounts of their distinctions, and their valuable qualities, it is hoped, may cause them to be fought out, and introduced into this country. Their different acorns might surely be easily imported.

Section 3.—Leaves lobed at the extremity.

52. Q. aquatica. Water Oak. Soland. in Ait. Hort. Kew. ed. 1. v. 3. 357. ed. 2. n. 111. Willd. n. 45. Pursh n. 11. Michaux Querc. n. 11. t. 19. t. 20. f. 1. 4. 5. and t. 21. (Q. foliis cuneiformibus, obfoletæ trilobis, intermedio produciōne; Gron. Virg. 149. Q. folio non ferrato, in fummate quasi triangulato; Catecb. Carol. v. 1. t. 20. Herb. Linn.)—Leaves wedge-shaped, smooth; tapering at the base; dilated and obscurely three-lobed at the end, the middle lobe largest. Calyx nearly hemispherical. Nut roundish.—Native of swamps in North America, from Maryland to Florida, blooming in May. Miller is said to have cultivated this species in 1748, but it is little known in England. The tree is forty feet high; its wood, according to Pursh and Michaux, is little esteemed; but the latter is of opinion that it might prove more valuable if felled in winter; he mentions also that the tree is not peculiar to swamps, or inundated meadows, but occurs sometimes in dry sandy ground, as on plains near the sea-coast of Florida. Few trees vary so much in the shape of their leaves, according to age or situation, as this. The proper form of its foliage is wedge-shaped, much elongated and tapering at the base; dilated, rhomboid, or very slightly and bluntly three-lobed at the extremity; the edges entire; both sides usually smooth. Footstalks variable in length, but rather short; clothed, when young, with flary hairs, which are sometimes scattered over the back of the young leaf. Some of its leaves, however, even on the same tree, are deeply three-lobed; and those of young plants are, the first year, oblong and quite entire; the next two or three seasons, variously toothed and fruticate; infusorial that botanists know not how well to distinguish its varieties from some of the following species. The acorns are short and roundish, with a shallow cup, and hand generally in pairs, on short stalks.

53. Q. nigra. Barren Oak, or Black Jack. Linn. Sp. Pl. 141. Willd. n. 46. Ait. n. 12. Pursh n. 15. Sm. in Abbots's Inf. v. 2. 115. t. 58. Michaux Querc. n. 12. t. 22. 23. (Q. marylandica, folio trifido, ad fllasfas accedente; Catecb. Carol. v. 1. t. 19.)—Leaves wedge-shaped; somewhat heart-shaped at the base; dilated, abrupt, and very slightly three-lobed at the end; the middle lobe hortèct; smooth above; ruly beneath. Calyx hemispherical, with membranous scales. Nut roundish-ovate.—In barren sandy or gravelly woods, from New Jersey to Florida, flowering in May. This tree is of low growth, especially in the more northern states. It bears abundance of acorns, very good food for hogs. The wood is small, but excellent for fuel. Pursh. The leaves are twice or thrice the size of the leaf, singularly dilated, and abrupt, at the end; their lobes, when young, more evident, and each tipped with a bristle, which soon falls off. Acorns mostly in pairs, nearly felled, with very few acorns.

54. Q. triloba. Downy Black Oak. Willd. n. 47. Ait. n. 13. Pursh n. 14. Michaux Querc. n. 14. t. 16. (Q. rubra; Abbots's Inf. v. 1. 99. t. 50.)—Leaves wedge-shaped, with three terminal, brilly-pointed lobes; the middle one longest; downy beneath. Calyx of the fruit flatish. Nut nearly round.—Native of barren tracts, near the sea-coast, from New Jersey to Georgia, flowering in May. It was brought to England in 1800, by Meffra. Frazer. The tree is fifty or sixty feet high, of rapid growth, even in a poor Soil. Michaux describes it as very fit for making live fences; though the wood is most generally used in America for paling. The leaves are much smaller than those of Q. nigra, rounded, not heart-shaped, at the base, and with longer footstalks. Their lobes are direct, not laterally dilated, each tipped with one or more small bristles, and the under face is covered with dense white down. The foliage of young shoots, that spring up where forests of this tree have been burned, are often near a foot long, deeply pinnatifid, and sharply lobed; as represented in Michaux, t. 26. f. 2.

55. Q. nova. Dwarf Jagged Oak. Willd. n. 48. Pursh n. 13. (Q. aquatica; Sm. in Abbots's Inf. v. 2. 117. t. 59. Q. aquatica elongata; Ait. n. 111. Q. elongata oblong-wedge-shaped, smooth, somewhat fruticate; three-lobed at the extremity; lobes divaricated, pointed, the middle one largest; forks of the vein downy beneath.—In barren lands, called pine-barrens, of South Carolina, flowering in May. Pursh describes it as "a low-growing species, always keeping distinct from Q. aquatica." The leaves are almost felled, two or three inches long, much more diligently lobed than in aquatica or nigra, and more fruticate or angular beside, than in any of the three last described. The acorns are almost globular, with a very shallow cup.

Section 4.—Leaves fruticate, with pointed lobes.

56. Q. hemisphærica. Hemispherical Oak. "Bartram's Travels 320." Willd. n. 49. Pursh n. 12. (Q. aquatica maritima; Michaux Querc. n. 11. t. 20. f. 2.)—Leaves oblong-wedge-shaped, smooth, somewhat fruticate; three-lobed at the extremity; lobes divaricated, pointed, the middle one largest; forks of the vein downy beneath.—In barren lands, called pine-barrens, of South Carolina, flowering in May. Pursh describes it as "a low-growing species, always keeping distinct from Q. aquatica."" The leaves are almost felled, two or three inches long, much more diligently lobed than in aquatica or nigra, and more fruticate or angular beside, than in any of the three last described. Willdenow says they are evergreen, and that the foliage of the young plant is fo like Q. phellos, our first species, as to be hardly distinguishable. Michaux, however, affirms this supposèd species to be but a maritime variety of aquatica, and Pursh thinks it a young plant of that kind.

57. Q. elongata. Downy-leaved Oak. Willd. n. 50. Ait. n. 14. (Q. falcata; Michaux Querc. n. 16. t. 28. Pursh n. 22. Q. difcolor; Ait. ed. 1. v. 3. 358.)—Leaves downy beneath, fruticate, with three or more somewhat falcate, brilly-pointed lobes; the terminal one elongated, jagged. Calyx hemispherical.—In sandy soil, near the sea-coast; from New Jersey to Georgia, flowering in May. A very large tree, commonly called Spanish Oak; in the southern states, Red Oak. Pursh. The height of the tree is fifty or sixty feet. Leaves on long stalks; obtuse or rounded at the base; deeply lobed, or in form measure palmate; the lobes often recurved, or fickle-shaped; taper-pointed, and more or less notched at the end, each segment tipped with a long bristle. Acorns small, roundish; its cup hemispherical, with lax
QUERCUS.

58. Q. tinctoria. Dyers Oak, Black Oak, or Quercitron. Willd. n. 51. Ait. n. 15. Pursh n. 16. (Q. tinctoria angustifolia; Michaux Querc. n. 13. t. 24). Q. discoolor; Willd. Arb. 274.)—Leaves downy beneath, obtuse-oblong, dilated, widely finnate; lobes short, obtuse, slightly toothed, bristle-pointed. Calyx of the fruit flat underneath. Nut globose.—In all large woods, particularly in the mountainous parts, from New England to Georgia, flowering in May. It is one of the largest trees of the American forest, highly valuable for its timber, as well as bark, which last is so very superior in tanning to any other species of Oak. Pursh says, this Oak is found only in a good soil, always at a distance from the sea; attaining its greatest size, which is eighty feet in height, and eight in diameter, in the valleys between the high mountains of North Carolina. The bark is used by tamers, throughout the north and west parts of the United States. It gives a yellowish colour, whence the name of Quercitron, and which enhances the value of the leather. The bark, bruised and powdered, was in great request among dyers in France, before the war interrupted this branch of commerce. The leaves are conspicuous for their broad, angular, abrupt figure, a span long, and nearly as wide, with shallow finnate, and bristle-tipped angles. Acorns almost fleshy, globular, with a feysy, hollow, flat-tip cup.

59. Q. discoolor. Sinuous Dyers' Oak. Willd. n. 52. Pursh n. 17. Sm. in Abbots's Inf. v. 2. 111. t. 56. (Q. tinctoria finnata; Michaux Querc. n. 13. t. 25). Q. virginiana, venis rubris muriis; Pluk. Phyt. t. 54. f. 5.)—Leaves downy beneath, oblong, pinnatifid; leaves oblong, toothed, bristle-pointed. Calyx turbinate. Nut ovate.—In large forests, from Pennslyvania to Carolina, flowering in May. This resembles the preceding and Q. coccinea, n. 61. The young expanding leaves are covered with white down on both sides, which is not the case with either rubra or cocinea. Pursh says, this differs from the last in having much more finnate, or pinnatifid leaves, and larger, more ovate, acorns, whose cups are turbinate, or tapering at the base. The qualities of the wood and bark probably agree with the tinctoria, or Michaux, who considers the present plant as but a variety, would have mentioned the contrary.

60. Q. rubra. Mountain Red Oak. Linn. Sp. Pl. 1413. Willd. n. 53. Ait. n. 16. Pursh n. 20. Michaux Querc. n. 20. t. 35. 36. Abbots's Inf. v. 2. 205. t. 103. (Q. eucalypti divaricata, foliis amplexibus acutatis; Pluk. Phyt. t. 54. f. 4.)—Leaves smooth, oblong, finnate, on long stalks; lobes acute, sharply toothed, bristle-pointed. Calyx of the fruit flat underneath. Nut ovate.—Native of forests on a fertile soil, from Canada to Pennslyvania, and in all the country west of the Allegheny mountains, blooming in May. It was cultivated by Miller before 1739, and is to be found in several plantations. A large and handsome timber tree, of rapid growth; its wood highly useful for building and for carriages; and the bark is said by Michaux to be the very best known for tanning, the European tanners, settled in America, having found it, by experiment, more efficacious than any of the oak barks of Europe. The tree is ninety or one hundred feet high. Leaves four or five inches long, on footstalks about half that length; unequally finnate or pinnatifid, with rather spreading, but not remote, lobes, whose ends are very acute, as well as here and there, sharply toothed, each tooth and point tipped with a long bristle. Acorns rather large, ovate, with a short flat-bottomed cup. The leaves turn of a deep red in autumn, which hue is common to most American trees and shrubs, in a greater or less degree. Pursh says, this is exclusively known by the name of Red Oak, though various others are so denominated in several parts of America.

61. Q. coccinea. Scarlet Oak. Willd. n. 54. Ait. n. 17. Pursh n. 18. Michaux Querc. n. 18. t. 21. (Q. rubra Ait.; Ait. ed. 1. t. 3. 357.)—Leaves smooth, oblong, deeply and widely finnate, on long stalks; lobes diversified, acute, sharply toothed, bristle-pointed. Calyx of the fruit turbinate, half as long as the nut.—Native of woods, on a fertile soil, from New England to Georgia, blooming in May. This was one of the first American trees brought to Europe, having been cultivated before the end of the 17th century, by bishop Compton, as well as by the first earl of Portland. The bright red foliage in autumn gives the tree a beautiful and striking appearance, both in its native forests and our European plantations. It nearly equals the preceding in fine; the wood, according to Michaux, is better, but the bark less valuable. The leaves are larger, with deeper, more rounded, stiufes, and more dilatant lobes. Acorns half covered by the deeper, more turbinate, cup.

62. Q. Catechus. Barren Scrub Oak. Willd. n. 55. Pursh n. 21. Michaux Querc. n. 17. t. 29. 30. (Q. rubra Ait.; Sm. in Abbots's Inf. v. 1. 27. t. 14. Q. eucalypti divaricata, foliis amplexibus acutatis; Catech. Carol. t. 1. t. 23.)—Leaves smooth, oblong; wedge-shaped at the base; deeply and widely finnate, on short stalks; lobes three or five, diversified, acute, two or three-cleft, bristle-pointed. Calyx of the fruit turbinate, half as long as the nut.—Native of dry barren ground in Maryland, Virginia, Carolina, and Georgia, abundantly, flowering in May. This species is shrubby, not above fifteen feet high; its wood of a bad quality, used only for firing. The shortness of the footstalks, and the fewness of the lobes of the leaves, added to their acute base, are sufficient botanical disjunctions between the present and the two last, especially as the size and quality of the tree are so unlike those species.

63. Q. palustris. Marsh, or Pin Oak. Willd. n. 56. Ait. n. 18. Pursh n. 23. Michaux Querc. n. 19. t. 33. 64.—Leaves smooth, oblong, deeply and widely finnate, on long stalks; lobes distant, parallel, acute, sharply toothed, bristle-pointed; forks of the veins densely woolly beneath. Calyx of the fruit flattened. Nut nearly globose.—Native of low swampy woods, from New England to Pennslyvania, and in the Illinois county, flowering in May. Mesfer. Frazer are recorded as having brought this species to England in 1805, but it was previously cultivated in Holland and France. This is a large tree, whose wood is tough, used for making spoks of wheels. The leaves are smaller than those of rubra or coccinea, and with more numerous lobes than Catechus; their finnate rounded and very wide, and the forks of the veins marked by a tuft of glandular hairs. The acorns are small, globular, with shallow cups, and generally very abundant.

64. Q. acutifolia. Pointed-leaved Mexican Oak. Willd. n. 57. Nee in Annal. Scienc. Nat. v. 3. 267. Eich. Mittl. Hft. 11. 122. Britton.—Leaves four to six inches long, on footstalks about half that length; unequally finnate or pinnatifid, with rather spreading, but not remote, lobes, whose ends are very acute, as well as here and there, sharply toothed, each tooth and point tipped with a long bristle. Acorns rather large, ovate, with a short flat-bottomed cup. The leaves turn of a deep red in autumn, which hue is common to most American trees and shrubs, in a greater or less degree.
QUERCUS.

inches broad, their footstalks an inch in length; ovate and unequal at the base, gradually contracting upwards to a sharp point, finuated, beset with awl-shaped teeth; green and thinning above; reddish and vein beneath, the forks of the veins villous. Female flowers in axillary four-flowered clusters, (or rather, we prefer, spikes.) Germs ovate. Acorns small, scarcely as big as a pea, nearly covered by the cup, which is clothed with blackish scales. Nee.

65. Q. candidissima. Hoary Mexican Oak. Willd. n. 58. Nee in Annal. Scient. Nat. v. 3. 277. Fitch, Mifc. Hilp. v. 1. 115. Willd.—"Leaves ovate, finuated; white and downy beneath; lobes toothed, bristle-pointed."—Native of New Spain, in sandy ground near Tixtala. A tree of a middling size, with a dense head of upright branches. Leaves nine inches long, four wide, tapering at each end, finuated, with bristled-pointed teeth; green and smooth above; white and downy underneath. Footstalks four lines in length. Flowers and fruit not observed. Nee.

66. Q. illisatia. Holly-leaved, or Bear Oak. "Wangen. Amer. 79. t. 6. f. 174." Willd. n. 59. Alt. n. 19. (Q. Banierti; Michaux Querc. n. 15. t. 27. Pursh n. 23. Q. aquatica? Sm. in Abbot's Inf. v. 2. 157. t. 79?)—Leaves obovate-wedge-shaped, with three or five deep bristled-pointed lobes, entire; downy beneath. Fruit stalked, in pairs.—Found in dry barren fields, and on mountains, from New Jersey to Virginia, flowering in May; covering, wherever it occurs, large tracts of ground, thence termed Oak-barrens. It is known by the name of Bear Oak, Black Scrub Oak, and Dwarf Red Oak. Pursh. A small four to six feet, occasionally more, in height, with downy branches. Footstalks downy, near an inch long. Leaves two inches, or two inches and a half long, and near two wide, tolerably uniform, acute at the base, cut into five, rarely but three, deep divericated, broad, acute lobes, entire at the margin, and scarcely toothed at the summit, though tipped with one or two bristles; the upper side green, veiny, and smooth; the under pale, and finely downy. Female flowers in pairs, on thick, solitary, axillary, downy stalks, much shorter than the footstalks. Acorns about half an inch long, nearly globular, half covered by their fealy hemispherical cups. Michaux thinks this species would serve well for making quick hedges. A specimen from Kalm, unnamed, is in the Linnaean herbarium.

67. Q. Pseudo-fiber. Baftard Cork Oak. "Santi Viagg. 156. t. 4." Spreng. Antiq. Bot. 16. t. 1. Willd. n. 63. Desfont. Atlant. v. 2. 348.—Leaves ovate-oblong, finuated, hoary beneath; lobes numerous, pointed, entire. Bark fleshy, cracked. Nut ovate. Calyx muricate, with lax, recurved, linear scales.—Native of the mountains of Tucanu, Spain, and Barbary. Desfontaines gathered it on mount Atlas, and the abbe Durand near Tangier. A tree fifty or sixty feet high, whose bark is corky, though less so than in Q. Suber, n. 32. Young branches downy or hoary, sometimes smooth, fringed. Leaves deciduous, an inch and a half to three inches long, an inch or an inch and a half wide, acute; entire and slightly heart-shaped at the base; somewhat dilated upwards, and bordered with numerous, uniform, small, broad, acute, lobes or serratures, separated by roundish sinuæ; upper surface green and smooth; under glaucous, hoary, or somewhat downy. Acorns on short stalks, ovate, above an inch long, half covered by the cup, which is downy, and clothed with lax bluish scales, recurved at their tips. Desfontaines says the leaves of young trees are deeply finuated and serrated; those of old ones more slightly so. In our specimens from Durand and Broulonet, the under side is scarcely downy, except a dense fringie to the mid-rib. The transverse veins are more numerous, straight, and parallel, than in Sprengel's plate. Footstalks rather above half an inch long, smooth or downy. Acorns nearly fleshy, crowded about the ends of the branches. Yet we think it must be, at least, the plant of Desfontaines.

68. Q. Europea. Great-branchly-cupped Oak, or Velanida. Linn. Sp. Pl. 1414. Willd. n. 61. Alt. n. 20. Mill. lc. t. 215. Olivier's Travels, English edition, v. 2. 44. t. 13. (Q. orientalis, calafane folio, glunde recondita in cupula cafjia et quafomuq; Tourn. Cor. 40. Velani; Tour Noy. v. 1. 128. Glans Cerri; Dallech. Hilu. v. 1. 7.)—Leaves ovate-oblong, with bristle-pointed tooth-like lobes; hoary beneath. Calyx of the fruit very large, hemispherical, with lanceolate, elongated, spreading scales. —Native of the Levant. Miller cultivated this Oak in 1731. The tree is not so lofty as some other species, nor is the wood much esteemed, or used, but in cabinet work. Leaves stalked, about three inches long, bright green; a little downy at the back; their edges, as in the last, very coarsely and acutely serrated, rather than lobed, each tooth tipped with a brily point. Acorn large, short, a little hollow at the top. Cup fesile, woody, two or three inches in diameter, from the projection of its numerous, oblong, thick scales. These cups are used, as well as the gall-nut, (see n. 46.) by the Orientals, Italians, and English, in dyeing, and are a considerable article of commerce. Tournefort says the modern Greeks call these acorns Velanida, a corruption of Palma, and the true Velanida. The young acorns and cups, gathered from the tree, are much more esteemed than such as fall of themselves, when fully grown, and fell for twice the price of the latter. Dalechamp, Lobel, and Bautin, mistake the urine cup and acorn of this species, as belonging to Q. Ceris, n. 83.

Sect. 5.—Leaves finuated, with blunt or pointlefs lobes.

69. Q. alba. White Oak. Linn. Sp. Pl. 1414. Willd. n. 62. Alt. n. 21. Pursh n. 29. Michaux Querc. n. 4. t. 5. (Q. alba virginiana; Cateb. Carol. v. 1. t. 21. f. 2.)—Leaves oblong, deeply pinnatifid; glaucous beneath; lobes linear-oblong, obtuse, entire, dilated upwards. Fruit stalked. Calyx depressed, warty. —Native of woods, on a fertile soil, from New England to Carolinas, flowering in May; cultivated here in 1724, by Mr. Purcell. Pursh says it is one of the most abundant and useful of its genus, in America, and grows in the middle States to an immense size. The adult leaves are nearly a fipan long, deeply and elegantly pinnatifid; tapering and acute at the base; gradually dilated upward; somewhat abrupt, though three-lobed, at the end; their lobes all entire, blunt, pointlefs, veiny; the upper surface green and thinning; the under opaque and glaucous; not downy, as Linnaeus and Willdenow define them, except perhaps when young. Footstalks short, angular, half an inch, or more, in length. Fruitchalks twice as long, each bearing one or two, lateraly sessile, ovate acorns. Full an inch in length, with a short tuberculated cup. Michaux observes, that this Oak is preferred to all others in America, for building houses and ships; as well as for cafsks. The wood is so tough and pliable, as to serve for making bafkets and brooms. The acorns are sweet, and Parkinon records that, in his time, the Indians were said to obtain from them, by boiling, an oil which they used in cookery. A supposed variety, called repandus, is figured by Michaux, in which the leaves are merely waved, not lobed; and green on both sides, though downy beneath. With this we are unacquainted, as also with Willdenow's intermediate variety, called pubescens. 

70. Q. Fagus. Italian, or Small-branchly-cupped Oak. Linn.
is more general in the woods and hedges of Britain, nor more important as an object of national culture. The tree is the most ornamental to our plantations and landscapes; the wood more useful than any other, for its hardnèfes, toughness, and durability; the bark peculiarly valuable for tanning. The leaves are alternate, with short, or scarcely any, footstalks, obovate-oblong, smooth, irregularly incised, with obtuse, rounded, pointèfs, entire leaves; their upper side of a rich shining green; the under pale, slightly glaucous; the base somewhat heart-shaped, or auricled. 

Chiffers, or rather spikes, axillary; the male ones lax, pedunculose, many-flowered, yellow; female on footstalks an inch and a half or two inches long, composed of about three, laterally sessile, green flowers, surrounded by a naked elongation of the common flalk. 

Calyx of the male branny, bell-shaped, mostly five-cleft, with about ten flòres; of the female carnaceous, scaly, downv, globose, at length hemispherical, woody, entire. 

Germn ovate. 

Style short, cylindrical. 

Stigmas three. 

Acorn elliptic-oblong, thrice the length of the cup. This being what Linnaeus, as well as British botanists, always considered as Quercus Robur, the superior quality of its wood, no where better understood than here, entitling it, above all others, to that appellation, we cannot, on any account, submit to the errors of Willdenow, or any other writer, who has been pleased to change the name; and we feel equal forprize and regret that the excellent editors of the new Hort. Kew. should, in this case at least, have carried their implicit conformity so far. We trust they will hereafter correct themselves in this point, as well as in the barbarous name Araucaria, retained by Willdenow, contrary to all propriety, for Dombeya. See that article.

72. Q. sessiliflora. Selfile-fruited Oak. 


Engl. Bot. t. 1845. (Q. Robur; Wild. n. 64. 

Ait. n. 23. Lamark Dict. v. 1. 717. 

Mart. Ruth. t. 11, var. sessilis. Q. sessilis; Ehrh. Arb. 87. Q. platyphyllus mas et femina; 

Dalech. Arb. 1342. 2. Q. sessiliflora var. sessilis. 

Bauh. Pin. 419. Raull Syn. 440, 

Leaves on longish footstalks, deciduous, oblong, smooth; 

finules opposite, rather acute; 


Native of woods and hedges, in the temperate parts of Europe; rather less common in England than the preceding, flowering in April or May. Professor Martyn has rightly corrected Miller, who mentions the present as the common Oak of this country, and the former as rare. Why the German botanists, like Lamark, take this for Robur, is difficult to understand, unless the mistake originated in inattention to the qualities, as well as history, of the trees. 

The wood of our sessiliflora, in which name we gladly follow Mr. Salisbury, is of far less value than the true British Oak, and the importance of distinguishing the two species becomes, therefore, the more obvious. The leaves grow on longer footstalks, and are generally more equally and regularly pinnatifid. The female flowers, and the acorns, are almost perfectly sessile. In English Botany four stigmas are delineated; but we know not how far that character, which would be an excellent one, is constant.

73. Q. pubescens. Downy-waved-leaved Oak. 

Wild. n. 66, excluding the reference to Fl. Brit. (Q. Robur lanuginosa; Lamark Dict. v. 1. 717. 

Robur prima; 

Clus. Dict. v. 1. 18.)—Leaves obovate, flaked, 

finulate; 

downy beneath; 

lobes obtuse, angular, wavy; 

somewhat heart-shaped and unequal at the base. 

Fruit nearly sessile—Native of France, Austria, Hungary, Tartary, and of the Val d’Aosta, Piedmont, in which last place it was gathered by Mr. Davall. We have seen a tree of
QURCII.

this species, growing on the north lawn at Holkham, Norfolk, the seat of Mr. Coke, where it was planted by his an
celor, the earl of Leicester; but no British writer seems
acquainted with the species in question, though unques
tionably distinct. Willdenow justly says it is like his 
lobes, but the foliage is different, being of more
Ait. 1797. P. pubescens; 
Ait. n. 25, but not of Wildenow. Q. Robur nigra; Lamarche Dict. v. 1. 717. Chêne noir; Secondat du chêne. 3. t. 57.—Leaves elliptic-oblong, falked, finuated; downy and hoary beneath; lobes numerous, obtuse, even, and en-
tire; base equal. Fruit Cicell. Native of France and the
south of England, flowering in April and May. Professor
Martyn had its specimens from the New Forest, Hampshire, in which it is known by the name of the Durmalt Oak. The
whole tree is well described by him as having much the air
of a chef-ten, and being of freer growth than the true Robur;
the bark lighter coloured and smoother; the wood not so
strong, nor of so firm a texture. The leaves are less deeply,
but more copiously, finuated, with five, six, or seven short
lobes at each side; the under surface downy, and of a hoary
grey, with purplish ribs. The foliage appears later than in
either of our common Oaks, and lasts longer, sometimes
the whole winter. Acorns Cicell, rather large. Lamarche's
description, indicated above, accords exactly with our
Oaks, but is Examined with our departed friend Willdenow, in dis
inguishing the Durmalt Oak from our felfiflora, but he errs in referring to it as pubescens, and has led 
Mr. Aiten into the same mistake. Its leaves are more oblong, less deeply
finuated, flatter, not undulated; the under side whiter, with
coloured veins. The fruit larger, and more decidedly Cicell.

Q. pyrenaica. Pyrenean Oak. Wild. n. 67.—
"Leaves oblong, pinatifid, falked; downy beneath;

somewhat heart-shaped and unequal at the base; lobes ob-
tufe, slightly toothed. Fruit Cicell."—Native of the Pyrenees.
The leaves are larger than in felfiflora, falked, deeply finuated; 
denly downy underneath. Fruit Cicell downy. Acorns four, Cicell on one common elongated falk.
It differs abundantly from pubescens, in having much
larger leaves, finuated in a pinatifid manner, very downy
beneath; and falked fruit. Such is Willdenow's account.
We have seen no specimen. Can this be our above-men
tioned variety of pubescens?

Wild. n. 68. (Thehodrys alba augufiifolia, fioio
ferrato; Dalech. Hift. 25.) Leaves on short downy
falkes, ovate, with numerous, uniform, shallow lobes;
downy beneath; somewhat heart-shaped and unequal at
the base. Fruit Cicell.—Native of Spain and the south of
France. Leaves small, an inch and half long, deciduous,
Falked, very slightly finuated, or, more properly speak-
ing, coarsely toothed, the lobes being very short, equal,
and obtuse; the upper side polished and smooth, the under
white and downy. Footfalks downy. Fruit Cicell. Will
denow. In the Limnanth earbarium are species, gathered
by Baron Alltienroer in Spain, which answer extremely
well to the above description, and not amiss to the figure
of Dalechamp, which Lamarche cites with hesitation. In the
free however, the lobes, or teeth, are acute, and the upper
surface covered with minute hairy hairs. There are also long,
linear, recurved, ramentaceous ftipulae, that are soon
deciduous. We do not scruple to consider this as Lamarche's
plant at least, and probably Willdenow's.

Mie. Hifp. v. 1. 116. Willd.—Leaves ovate-vedge-
shaped, finuated, smooth; lobes toothed."—Native of New
Spain. Branches furrowed, alternate. Leaves four inches
long, two inches, and half wide, smooth, alternate, orbi-
cular towards the extremity; wedge-shaped at the lower
part; finuated; the lobes rounded, obtuse, toothed. Foot-
flakes slender, three or four lines in length. Nee.

78. Q. obfulfoba. Blunt-lobed Iron Oak. Michaux
Querc. n. 1. t. 1. Purf. n. 25. (Q. ftellata; Wild.
n. 71. Ait. n. 26. Wengenh. Amer. 78. 6. t. 15.)—
Leaves oblong, finuated, roughish on both sides; lobes ob-
tufe; the upper ones dilated, abrupt, slightly divided.
Calyx of the fruit hemispherical.—Found in mound of the up-
land forests, from Canada to Florida, blooming in May. 
The tree is fifty or sixty feet high, spreading, its timber of
great value for ship-building. The whitenefs of the bark,
as in Q. alba, causes both these species to be called White
Oak by the Americans, who nevertheless know how to dif-
tinguish their timber. The leaves of the pretant are roughly
beneath, with minute rusty hairs, not hoary; and their
upper surface appears to partake occasionally, if not always,
of the same fort of pubefcence. Their length is from three
to five inches; the base wedge-shaped, spreading upwards
into two smaller, opposite, rounded lobes, beyond which the
fog' dilates, suddenly and widely, into a pair of broad,
flattly cloven, or emancipate, lobes; and, after another
sudden contraction, ends in a terminal three-cleft one. 
The margin is entire throughout. Footfalks short, downy.
Acorns three or four on a short falk, of a middling fize,
scarcely exceeding our British Oaks, elliptical, about half
enfolved in the fcaly cup.

79. Q. lyrata. Over-cup Lyrate Oak, Swamp-poif, or
Ait. n. 27. Purf. n. 28. Michaux Querc. n. 3. t. 4.—
Leaves oblong, deeply finuated, smooth; much contracted
in the middle; lobes acute; the upper ones dilated, an-
gular, and abrupt. Calyx of the fruit glofbo, mucrinated,
nealy covering the nut.—Native of swamps, from Carolina
to Florida, and on the Missifipi; flowering in May. Purf.
Michaux says, that though he always found these species in
waterly places, its growth, in a dry surfly-ground, ex-
ceeded that of all other species planted with it. He gives
fifty or sixty feet as the height of the tree; Purf from eight
to fifteen only. The smooth fine-green leaves have more
acutely-angular lobes than the foregoing, and are remark-
ably contracted about the middle. Acorn glofbo, nearly
covered by the globular prickly cup.

80. Q.
80. Q. macrocarpa. Large-fruited Oak, or Over-cup White Oak. Wild. n. 73. Pursh n. 26. Michaux Querc. n. 2. t. 2. 3.—Leaves oblong, lyrate; downy beneath; terminal lobe very large, three-clit, finnatin. Calyx of the fruit hemispherical, scaly, fringed with bristles.—Found on dry flat or limehony hills, in all the countries to the west of the Alleghany mountains, flowering in May. A large tree, with a whole wood, according to Pursh and Michaux, is very excellent. The bark of the young branches is corky. In wet situations the whole plant languishes, and becomes covered with lichens. The leaves are a foot long, more truly and precisely lyrate than those of the last; but the specific name of the prefont is excellent, the acorns being larger than those of any other known American species. Their form is oval, their length two inches, and they are half covered by the cup, several rows of whose broad scales end in long bristles, making a rigid fringe.

81. Q. oliveformis. Olive-shaped Mycty-cup Oak. "Michaux Arb. v. 2. 32. t. 27." Pursh n. 27.—Leaves oblong, smooth, glaucous beneath; deeply and unequally pinnatifid. Fruit elliptic-ovate. Calyx cup-shaped, fringed."—Observed by Michaux on the banks of Hudson's river, and in the western parts of New York; by Pursh in Pennsylvania and Virginia, on iron-ore hills; flowering in May. This is described as a large tree; the foliage handsome, somewhat resembbing that of the last. We have not examined either a specimen or figure. Willdenow does not mention this species.

82. Q. cirtina. Hairy-cupped Oak. Lamarrck Dict. v. 1. 718. Olivier's Travels, English edition, v. 2. 5. t. 12. (Q. Tournefortii; Wild. n. 74. Q. orientalis latifolia, foliis ad collam pulchrre incisis, glade maximâ, cupulâ cuntis; Tourn. Cor. 40. Voy. v. 2. 172.)—Leaves on long stalks, oblong, deeply pinnatifid; downy beneath; lobes lanceolate, blunt, nearly entire. Calyx of the fruit hemispherical, downy, bristly.—Gathered by Tournefort in vallies and plains near Tocat, in Armenia. Olivier says it is met with throughout great part of Asia Minor and Syria. The timber is brought to the arsenal of Constantinople, from the southern shores of the Black Sea, and is also most commonly employed for the frame-work of houses. The tree grows to a considerahle height, and furnishes excellent wood. He, who takes the tree in question for Q. Cerris of Linnaeus, may, possibly, confound the real Cerris along with it, as Lamarrck, though not without error, has combined them. Olivier's plate, however, very clearly represents the above plant of Tournefort; and Lamarrck's excellent definition of the same, a variety of his cirtina, is abundantly sufficient to flarip it a species.

"Leaves very softly villous, deeply pinnatifid; their segments oblong, nearly simple, obtuse, somewhat peltate, (or parallel.) He says it is reported to grow wild in the province of Angoumois, and is a tree of handsome aspect, remarkable for its soft, downy, broad leaves, cut very deeply into large segments, blunt at their extremity, often simple, sometimes furnished with a few angles, or short lobes, at their posterior margin. Acorns fehle, their cup bristly, as in the Burgundy Oak (Cerris). Tournefort's specimens agree with the Angoumois Oak, and is called, seen by Lamarrck in a cultivated plantation, at Genoanville. We have seen no specimen, but the above accounts are sufficiently clear to admit of no doubt. Olivier's plate represents the leaves three or four inches in length, their segments about an inch long, almost all simple and undivided, bluntish, entire, more or less divaricate, each making an angle with the narrow linear border of the main rib. Footstalk slender, an inch, more or less, in length, apparently smooth. Acorns lateral, about an inch long, elliptical, obtuse, solitary, on short simple stalks; the cup beft with numerous soft taper bristles, divericated upwards and downwards, near half an inch long. Nothing is exhibited, or described, concerning the species, which are very remarkable in the two following species.

83. Q. Cerris. Turkey Oak. Linn. Sp. Pl. 1415. Wild. n. 75. Alt. n. 28. (Q. cirtina x c. ; Lamarrck Dict. v. 1. 718. Q. halipheus; Jull. in Hort. Paris. Q. burgundica, calyce hispido; Bauh. Pin. 420. Cerris Pinn. majore gladio; Lob. l. c. v. 2. 156. Dod. Pempt. 834. Ger. Em. 1345. Cerris; Dalech. Hift. v. 1. 6. 50.)—Leaves coarsely serrate, oblong, deeply and unequally pinnatifid; hairy beneath; the lobes lanceolate, acute, somewhat angular. Stipulas longer than the footstalks. Calyx of the fruit hemispherical, bristly.—Native of France, Italy, and the Levant. Sometimes cultivated in England, but not commonly. This is a tall handsome tree, whose synonyms are much confused by old writers with Q. Aegilops, n. 68, and by more recent botanists with the following. Its leaves are deeply pinnatifid in the manner of the foregoing; or more or less unequally; but the lobes are more acute, pointed, and most generally angular, sometimes remarkably lobed or compound. The under side differs essentially, in being neither downy nor hoary, but rough with minute, scattered, tawny, bristly hairs; the upper, which is of a darker green, and rather shining, is also occasionally roughish to the touch. Footstalks rough, thick, hardly a quarter of an inch, sometimes not a line, in length. Stipulas linear, acute, downy, from half an inch to an inch long, permanent, accompanied by an axillary tuft of similar, but smaller, scales. The acorns we have not seen. They are represented sessile, two or three together, large, oblong, with an hemispherical cup, which is faggy with long bristles, projecting in every direction. They are said to be peculiarly bitter and astringent.

Lamarrck affirms, from his own observation, that the Q. orientalis latifolia, glade maximâ, cupulâ cuntis, Tourn. Cor. 35, barely differs in any respect from this. If so, the term latifolia is not appropriately applied, unless Tournefort had also noticed, as in our leaf, the deep divisions of the leaves, which are full as remarkable in the present species.

84. Q. aegilops. Austroian Oak. Wild. n. 76. (Q. Cerris; Hoff. Syn. 520. x and z. Alt. n. 28. Q. cirtina, c. Linn.; Lamarrck Dict. v. 1. 718. Q. calyce hispido, glade minor; Bauh. Pin. 420. Cerris; Cluf. Hift. v. 1. 20. excellent. Cerris minoris ramulus cum flore; Ger. Em. 1346, with Clufius's figure. Cerris Plinii minoris gladio; Lob. l. c. v. 2. 156. Ger. Em. 1345. Aegilops minore gladio; Dod. Pempt. 831. Halipheus, Cerris foemina; Dalech. Hift. v. 1. 7.)—Leaves on long stalks, ovate-oblong, slightly but copiously imbricate; downy and hoary beneath; lobes short, ovate, acute, entire. Stipulas shorter than the footstalks. Calyx of the fruit hemispherical, bristly.—Native of Aulania, Hungary, Carniola, Italy, and other parts of the south of Europe, in flary mountainous places. It occurs not unfrequently in plantations of exotic trees, both in France and England, being generally mistaken for Q. Cerris, from which it is only too easily be more certainly distinct. This tree is taller than the Common Oak, Q. Robur, and in favourable situations rises perpendicularly to a considerable height, as Clufius described it; though Lamarrck says it is smaller, less handsome, more twisted and knotty, than the last, as well as often hollow. The wood is whiter, softer, and less valuable, than Q. Robur; the bark grey, tolerably even. Branches forming a round
leaves two or three inches long, acute, generally rounded and a little unequal at the base; their upper surface of a fine shining green, and nearly smooth; the under whitish, clothed with fine dense down; the margin cut, at each side, into four, five, or six, tolerably regular, rounded or ovate, acute, pointed, entire lobes, more or less deep, separated by round sinus; the disk of the leaf being left entire, of a considerable width. Footstalks near an inch long, downy. Stipulas as in the foregoing, but smaller and shorter, usually about half the length of the footstalks. Acorns like those of the luff, but smaller. The figures of Lobel, Dodonaeus, and Ger. Em. 1346, do not well represent the leaves of this species, or indeed of the former: that of Clusius, adopted by the editor of Gerard, in p. 1346, is perfectly correct. The cuts of Dalechamp, both of one and the other, are sufficiently expressive, and very correct as to the footstalks. The lobes of either of these species are quite pointed, but rather more pointed, as well as acute, than those of Eustachus, n. 70.

We have thus added eight species of Quercus to Willdenow's list. Those botanists who may take the trouble of following us with attention, will perceive that this valuable genus itself requires elucidation, particularly with respect to the European, and, above all, the oriental kinds; some of which, barely indicated by authors, we have been obliged to leave unexplained. Of the most common and important species, Q. Robur, we have seen in Mr. Coke's woods at Holkham, some striking varieties, at least, whose distinctions and qualities are well worthy of examination. Two of these have shorter flower-stalks than the common Robur, and one of them is three weeks earlier in coming into leaf than the other. The footstalks of both are longer than is usual in Robur. How far a difference of quality in the wood may accompany these botanical distinctions, we must refer to the inquiries of those who are interested in, and have the means of investigating, so important a subject, which is indeed of the first economical, and even national, consequence. It is much to be wished that the species of the Norway Oak, so valuable for floors, on account of its straightness, and freedom from knots, could be determined. Perhaps these circumstances are owing to its being drawn up straight, with few branches, in its clove native forests, and therefore it may not be specifically different from one or other of our own species. Michaux, and other writers on the American Oaks, have taught us, that the pubescence of the leaves in this genus is of more specific importance than had previously been supposed, and we therefore have paid the more regard to it in discriminating those of the European kinds. The flowers, male and female, appear still to demand more precise investigation and comparison, than they have any where received. S.

Quercus, in Gardening, furnishes plants of the forest, deciduous, evergreen, ornamental tree-kinds, of which the species cultivated are, the common oak-tree (Q. robur); the willow-leaved oak-tree (Q. phellos); the chestnut-leaved oak-tree (Q. prunus); the black oak-tree (Q. nigra); the red oak-tree (Q. rubra); the white oak-tree (Q. alba); the Italian or small prickly-cupped oak-tree (Q. cifculus); the great prickly-cupped oak-tree (Q. argilopa); the Turkey oak-tree (Q. cerris); the evergreen or holm oak-tree (Q. ilex); the holly-leaved evergreen oak-tree (Q. grahamia); the cork-barked oak, or cork tree (Q. lubr); and the kermes oak-tree (Q. coccifera).

Of the first there are several varieties; as with the acorns on long peduncles. This is found in the woods of Kent and Sussex, where there are many large trees. The leaves are not so deeply sinuate, nor are they so irregular as in the common fort; but the indents are opposite; they have scarcely any footstalks, but fit close to the branches; but the acorns stand upon very long footstalks. The timber of this fort is accounted better than that of the common oak, and the trees have a better appearance.

The broad-leaved evergreen oak, which grows upon the Apennines, and also in Sicilia and Portugal. The leaves are broader, and not so deeply sinuate as those of the common oak; they are of a lighter green on their upper side, and pale on their under; have very short footstalks, and their points are obtuse; the acorns have very long footstalks, which frequently sustain three or four in a cluster.

The dwarf oak, which grows in the south of France and Italy, and is a low bushy oak, rises but six or seven feet high, sending out many slender branches the whole length. The leaves are oblong, and obtusely indented, about three inches long, and an inch and a half broad, standing upon slender footstalks; the acorns small, growing in clusters.

There are also many other varieties of common oak, which dealers in timber and woodmen distinguish by their use, qualities, and accidents, and to which they give different names; but these being merely local, and not founded on permanent characters, it is difficult to ascertain them.

In the second species they distinguish two sorts; one of which is called the Highland willow oak, and grows upon poor dry land; the leaves are of a pale green, and entire, shaped like those of the willow tree; the acorns are very small, but have pretty large cups. The other grows in low moist land, and rises to a much greater height; the leaves are larger and narrower, but the acorns are of the same size and shape. It is suggested, as probable, that their difference may be owing to the soil in which they grow. Martyn observes, that the latter becomes a large timber tree, and that there are said to be several varieties of it.

The third species has seemingly two varieties, one of which grows to a much larger tree than the other; but this may be occasioned by the soil, for the largest trees grow in rich low lands, where they become bigger than any of the North American oaks. The wood is not of a very fine grain, but is very serviceable; the bark is grey and leathery; the leaves are five or six inches long, and two inches and a half broad in the middle, indented on the edges with many transverse veins running from the midrib to the borders; they are of a bright green, and do nearly resemble those of the chestnut tree as scarcely to be distinguished from it. The acorns are very large, and their cups are short. The leaves of the other variety are not to large, nor so strongly veined; and the acorns are smaller, and a little longer. The different varieties are distinguished by the form of their leaves, which in the one is ovate, and in the other oblong.

The fifth fort has several varieties.

And in the ninth fort there are several varieties. The tenth species has likewise several varieties, differing greatly in the size and shape of their leaves; but these will all arise from acorns of the same tree: even the lower and upper branches have very frequently leaves very different in size and shape; those on the lower branches being much broader, rounder, and their edges indented and let with prickles; but those on the upper long, narrow, and entire. The leaves are from three to four inches long, and an inch broad near the base, gradually lessening to a point; they are of a lucid green on their upper side, but whitish and downy on their under, and do not fall till they are shrivel off.
off by young leaves in the spring. The acorns are smaller than those of the common oak, but of the same shape.

The twelfth species has also two or three varieties; one with a broad leaf, a second with a narrow leaf, both evergreen; and one or two which call their leaves in autumn; but the broad-leaved evergreen is the most common. The leaves of this are entire, about two inches long, and an inch and quarter broad, with a little down on their under sides, on very short footstalks; these leaves continue green through the winter till the middle of May, when they generally fall off before the new leaves come out, so that the trees are often almost bare for a short time. The acorns are very like those of the common oak.

The exterior bark forms the cork, which is taken from the tree every eight or ten years; but there is an interior bark which nourishes them, so that stripping off the outer bark is so far from injuring the trees, that it is necessary to continue it: for, when the bark is not taken off, they seldom last longer than 50 or 60 years in health; whereas trees which are barked every eight or ten years will live 150 years, or more. The bark of a young tree is porous, and good for little; however, it is necessary to take it off, when the trees are twelve or fifteen years old, for without this the bark will never be good. After eight or ten years, the bark will be fit to take off again; but this second peeling is of little use. At the third peeling, the bark will be in perfection, and will continue so for 150 years; as the bellow cork is taken from old trees. The time for stripping the bark is in July, when the second sap flows plentifully: the operation is performed with an instrument like that which is used for dibbarking the oak.

It is from the last species they collect the kermes, or scarlet grain, a little red gall, occasioned by the puncture of an insect called casculus. With this the ancients used to dye cloth of a beautiful colour.

Method of Culture.—These trees are all capable of being raised from the seed or acorns, which, in the common oak, should be gathered in autumn when quite ripe, just as they drop from the trees; but those of most of the foreign oaks are generally procured from abroad, and sold by the seedmen.

All the forts should be sown as soon after they are obtained as possible, as they are apt to sprout if they remain long out of the ground; and for their reception, a spot of light ground in the nursery should be prepared by digging or ploughing, dividing it into four feet wide beds, in which the acorns should be sown, either in drills, two inches deep, in five or six rows lengthwise of the bed; or rake the mould off the bed, the depth of two inches, into the alleys; then sow the acorns all over the surface, about two or three inches apart, press them down with the spade, and spread the earth evenly over them two inches thick. When they come up in the spring, they should have occasional waterings and weeding; and when the plants are one or two years old, it is proper to plant them out in nursery-rows: this may be done in autumn, winter, or early in the spring, taking them carefully up out of the feed-bed, shortening their perpendicular tap-roots, and trimming off any lateral shoots from the stem, leaving their top perfectly entire; then planting them in lines two feet and a half asunder, and fifteen or eighteen inches in the rows, where they should stand, with the usual nursery care, till of a proper size for final planting out either as forest trees, or for ornament, training them up asbool standards, with clean straight limbs, and with their tops still entire.

But in raising the stippled-leaved varieties of the common oak, and any particular variety of the other species, it should be by grafting, (as they will not continue the same form from seed,) which should be performed upon any kind of oakling stocks raised from the acorns, and trained for standards, as in other kinds.

With respect to the final planting out, it may be performed in all sorts of deciduous oaks any time in open settled weather, from November till February or March; and in the evergreen kinds in October, November, or the spring; and in a mild open season in any of the winter months.

When the trees of all the sorts are from about three or four to six feet stature, they are proper for being planted out for good; though, as forest or timber trees, it is better to plant them out finally while they are quite young, as from two to three or four feet in height; or when planted immediately from the feed-bed, where they are to remain, it may be advantageous, as the very young oaks root more freely than older trees, and take a freer growth. Those designed as forest or timber trees should be planted in large open tracts of ground, to form woods, placing them in rows only from four or five to ten feet asunder, and from two or three to five or six feet in the rows, to allow for a gradual thinning. But perhaps the best method of all for raising them, as timber trees, is from the feed, by fowing or setting the acorns. See PLANTATION and PLANTING.

Sometimes, indeed, large plantations of these trees, for woods, are raised by sowing the acorns at once in the places where they are to remain; it being generally found that the trees raised at once from the acorn, from their not being checked, much outstrip the transplanted trees in their growth. The method of performing it is this: the ground being prepared by good ploughing and harrowing in the autumn, having procured a proper quantity of acorns, draw drills across the ground four feet asunder, and two inches deep, dropping the acorns into them five or six inches asunder, allowing for failing and thinning, covering them in evenly with the earth the depth of the drills; or, instead of drilling them in, they may be planted with a dibble the same depth and distance.

The general management of these trees in woods, or timber plantations, is the same as directed for forest trees in general. See PLANTATION.

All the above sorts of trees may be employed to diversify large ornamental plantations in out-grounds, and in forming clumps in spacious lawns, parks, and other extensive open spaces: the evergreen kinds, in particular, have great merit for all ornamental purposes in pleasure-gounds and plantations. And all the larger growing kinds, both deciduous and evergreens, are highly valuable as forest trees for timber; but the first sorts claim precedence as a timber tree, for its prodigious height and bulk, and superior worth of the wood.

In planting any of the species for ornament or variety in large pleasure-gounds, some may be disposed in assemblage in any continued plantation, some in clumps, and others singly.

All the different sorts of the oak will succeed in any soil of a middle quality, where the exposure is not unfavourable; but to the most advantage, where the land is of a loamy nature: they, however, thrive tolerably in those soils which are of a gravelly, sandy, or clayey description.

Besides the great value of these sorts of trees for the utility and durability of their wood, as timber, for the purposes of ship-building, house-building in some parts, park-paling, poles, railings, and a variety of other strong uses; they, in many of the kinds, afford considerable additional advantage.
advantage by their produce in bark, for the use of the tanners and cork-cutters, in tanning leather, and being made into corks; after the former of which, it is also much employed in gardening, for the forming of bark hot-beds, in raising tender hot-houset plants; as well as in their annual crops of acorns, as an excellent food for the keeping and fattening of swine, deer, and some other animals.

Quercus, in Planting, a classical term sometimes applied to the oak-tree in nursery collections, intended for this sort of application. See Oak-Tree.

Quercus Marinus, the Sea-Oak, in Botany, the name of one of the broad-leaved dichotomous sea-facilies.

It is not agreed, among the late botanists, what was the sea-oak of Theophrastus; and the most ancient botanists, Clusius and Caelcipinus, suppose it to have been a species of the holly or common holly; but that seems by no means to have been the case, since Theophrastus says his sea-oak had a long, thick, and fleshy leaf, whence we may much more naturally conclude it to have been of the fucus clafs.

Quercy, in Geography, a province of France before the revolution, in the government of Guienne; bordered on the E. by Rouergue and Auvergne, on the S. by Upper Languedoc, on the W. by Perigord and Agenois, and on the N. by Limosin: it contained two bishoprics, viz. Cahors and Moatzauban. The air is good, and the land is fertile: its capital was Carhors. It now constitutes the department of the Lot.

Quereiva, in Ornithology, the purple-throated chatterer of Latham, a species of Ampelis.

Querela, Quarrel, in Law, denotes an action, or declaration, preferred in any court of judicce. See Quarrel.

In an action where the plaintiff is called querens, i.e. complainant, his brief, complaint, or declaration, is called querela.

Querela Audita. See Audita.

Querela coram rege et concilio, a writ by which one is called to justify a complaint of a trespass made to the king himself, before the king and his council.

Querela Duplex. See Double Quarrel.

Querela, ex gratia. See Ex Gratia, &c.

Querenghi, Antonio, in Biography, a man of letters, was born at Padua in 1546. He displayed, at an early period of his life, a decided attachment to literature; he wrote verses before he was twelve years of age, and soon became distinguished by his deep knowledge of the languages, civil laws, and the philosophy that was taught at that period. For some time he applied himself to theology, and made considerable proficiency in it. He next went to Rome, where he entered into the service of several cardinals, and at length became secretary of the sacred college, in which capacity he was present at the election of five popes. Clement VIII. conferred upon him the canonry of Padua, which occasioned him to reside in that city, but he returned to Rome in the pontificate of Paul V., by whom he was promoted to some offices of trust. He died at Rome in 1623, at the age of 87. He was a man of various and extensive literature, and was much regarded by the learned of the time in which he flourished. His writings were numerous, and comprehended the sciences and polite literature. He is chiefly known to poftlitry by his poems, which are correct and elegant, but by no means animated. Moreri.

Queretano, in Geography, a town of Mexico; 83 miles N.W. of Mexico. N. lat. 20° 25'. W. long. 101° 36'.

Querfalla, in the Materia Medica of the Arabians, a name given by Avicenna and others to cinnamon, when gathered with the wood of the young branches.

It was a common practice in the early times not to strip the small bark from medicinal trees, but to cut off the little boughs, and use the bark and wood together. This the Greeks called zeo cinnamon, or woody cinnamon; and the Arabs, querfa, quyrfa, or kvrs.

Querfurt, in Geography, a town of Saxony, situated on the little river Weite, not considerable in itself, but having large suburbs; the number of houses is estimated at upwards of 500. The old castle belonging to it stands on a hill, and it has likewise a superintendency; 16 miles S.W. of Halle. N. lat. 51° 23'. E. long. 11° 45'.

Queria, in Botany, received that name from Loedling and Linnaeus, in compliment to Don Joseph Quey Martinez, a Spanish surgeon, who though he wrote against the Linnean system, and even the sexes of plants, contending that palm-trees ripen fruit without impregnation, was an affiduous practical botanist. He published a Spanish Flora, in his native tongue, consisting of four volumes quarto, of which the first three appeared in 1762, and the fourth in 1764. A fifth and sixth were added by Ortég in 1784. Queyr was professor of botany in the royal garden at Madrid, and died in 1764, aged 60. He wrote also on the Uovo Ufis, in which he removes from the genus Arbtrak, as a specific in calculous complaints; and on the medical use of Cicerute. —See Haller's Bibl. Bot. v. 2. 516, and Dryand. Bibl. Banks. —Linm. Gen. 43. Sched. 58. Wild. Sp. Pl. v. 1. 403. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 1. 185. Juff. 500. Lamarek Illusr. t. 52. Gärtn. t. 128.—Chaf and order, Triaendria Triphylla. Nat. Ord. Caryophyllis, Lin. Jull. Gen. Ch. Col. Peranther inferior, of five creet, oblong, acute, permanent, leaves; the outermost recurved. Cor. none. Stam. Filamentous, capillary, short, and anthers roundish. Pyf. Germin superior, ovate; styles three, the length of the filaments; stigmas simple. Peric. Capsule roundish, of one cell, with three valves. Seal solitary, roundish, compressed.

Eff. Ch. Calyx of five leaves. Corolla none. Capsule of one cell, with one seed.

Obi. Linneus remarks, that this genus differs evidently from Minuartia, see that article, in having a solitary seed. Q. canadenfis, figured by Gartner, is removed hence by Michaux to his genus Anycbia, which belongs to a different natural order, the Holarctae of Linneus, and has a capsule defitute of valves. Gartner indicates its close affinity, except in number of flaments, to his Paronychia, see that article. Michaux and Pursh affer that its flaments vary from two to five.

1. Q. biflurica. Spanish Queria. Linm. Sp. Pl. 132. Wild. n. 1. Ait. n. 1. Loed. It. 48. 83. Quer. Pl. Elpan. v. 6. 667. t. 15. f. 2.—Flowers crowded into a tuft. —Native of fandy grounds in Spain. Seeds were sent to Kew, in 1830, by the late marchionefs of Bute. The plant is a diminutive hardy annual, flowering most part of the summer. Root fibrous. Whole herb whitish, brittle, one or two inches high, with several leafy, round, rather downy, slightly redaht joints. Leaves opposite, fiform, awl-shaped, three-ribbed, curved to one side, rather longer than the joints of the stem. Head of flowers oblong quadrangular, deeply dichotomous, easily breaking off from the stem. Bractes opposite, awl-shaped, recurved, and hooked, easily catching hold of the coats of animals. Flowers very mimic.

Gron. Michaux, two of his celebrated from Mantes, the town determined four miles N. of Quimperle.

QUERON, a town of South America, in the jurisdiction of Risambala.

QUEREO. See Querepo.

QUEREOEDULA, in Ornithology, a species of Anas. See Duck and Teal.

QUERRE, in Geography, a town of France, in the department of the Mayence and Loire; 12 miles N. of Angers.

QUERRENIEN, a town of France, in the department of the Finisterre; six miles N. of Quimperle.

QUERRIES, or Equerries. See Equerry.

QUERRIEUX, in Geography, a town of France, in the department of the Somme; six miles N.E. of Amiens.

QUERRY, Gentleman of the, is an officer appointed to hold the king's stirrup, when lie mounts on horseback.

QUERS, in Geography, a town of France, in the department of the Upper Saone; three miles S.E. of Luxeuil.

QUESADA, a town of Spain, in the province of Jaen; 12 miles S.E. of Ubeda.

QUESENDORF, a town of Prussia, in the palatinat of Culm; four miles S.E. of Brenchen.

QUESNAY, Francis, in Biography, a celebrated French physician, was born at Mercy, a little town not very distant from Paris, in 1694. His family were employed in rural occupations, and gave him no other education than was deemed necessary for their mode of life; so that at the age of sixteen he was scarcely able to read. About this time, however, a thirst for information seized him, and partly by the indulgence of a country surgeon, and partly by his own labour, he acquired a knowledge of Latin and Greek, and entered with ardour into the study of the ancient and modern writings on philosophy. In opposition to the prevailing notions of his relations, he resolved to turn his pursuits to medicine, having perceived its connection with the various branches of physical science; and his master, the surgeon of Ecueville, was soon convinced of the superior acquirements of his pupil, some of whose essays he presented as his own, on applying for admission into the college of St. Côme, and they were received with great applause. This still farther routed the zeal of Quefnavy, and he repaired to Paris, where he entered with great avidity into the studies connected with the profession. After some time he settled at Mantes, a considerable town in his native province. Here he was discovered by Garengeot, an eminent surgeon, who was engaged with Peyronie in an attempt to establish an academy of surgery, for the collection of surgical knowledge. Having written a refutation of the doctrines of Silva, respecting blood-letting, which led him to a public controversy, in which he was deemed victorius by Peyronie, he displayed such profound views, indefatigable zeal, and great general knowledge, as determined Peyronie to appoin him the secretary of his new academy. This distinguished post raised him still higher in the public estimation; but the labours connected with it at length injured his health, which had been for some time delicate, and he determined to turn his attention to medicine more particularly, and took the degree of doctor of physice. He had been employed during the campaigns of the king, and on the death of M. Terray was appointed consulting physician to his majesty; and was much esteemed and favoured by madame de Pompadour; she seems, indeed, to have been much employed, and to have been held in high consideration by the dauphin.

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the father of Louis XVI., and by the whole court. After the dauphin had undergone the small-pox, the king presented him with letters of nobility, unfilicted, as a mark of his esteem. He was appointed also first physician in ordinary to his majesty. He was a member of the Academy of Sciences, of the Royal Society of London, &c. Notwithstanding his long life, and his courtly favour, as well as extensive employment, he died possessed of little fortune; his liberality to his friends having prevented him from accumulating money. His death took place at Verfaillles, in December, 1774, at the age of eighty.

This able and indefatigable man left several works, which bear the stamp of considerable research, clear and methodical views, and acute observation, mixed, however, with some disposition to hypothesis. His first essay on blood-letting, already mentioned, was published in 1730, under the title of "Observations sur les Effets de la Saignée, avec des Remarques critiques sur la Traité de Silva;" and a second edition, considerably enlarged, was printed in 1750. But in the mean time he published another work, entitled "L'Art de Guerir par la Saignée," Paris, 1736, in which he recommends blood-letting in many diseases. In the same year appeared his "Essai Physique sur l'Economie Animale," in two volumes, 12mo., which was reprinted in 1747, in three volumes. This work, however, was deemed very imperfect by Haller, and is in fact characterized by a love of hypothesis, rather than by the details of experience and observation. In 1743, his "Preface des Memoires de l'Academie de Chirurgie," gained him considerable applause, as a work of literary research. In 1744 he published his "Recherches critiques et historiques sur l'Origine, sur les divers Etats, et sur les Progrés, de la Chirurgie en France," which called forth some remarks on the alleged inaccuracy of some of the historical statements. His other publications were entitled, "Testament de M. de la Peyronie du 18 Avril, 1747;" "Examen impartial des Confections des Medecins et des Chirurgiens de Paris," 1748, 12mo.; "Memoire préfenté au Roi par son premier Chirurgien, où l'on examine la Sageffe de l'Ancienne Législation sur l'Etat de la Chirurgie en France," 1749, 12mo.; "Traité de la Suppression," 12mo.; and "Traité de la Gangrée," 12mo.; all in the year 1749. And lastly, his "Traité des Fièvres continues," 1753, in two volumes, 12mo. Eloy Dict. Hifi. de la Médecine.

QUESTE, ABRAHAM DU, an able French naval commander, was descended from a noble family in Normandy. He was born in 1610, and was brought up to the sea-service under his father, who gave him the command of a vessel when he was only seventeen years of age. In 1637 he was present at the attack of the isles of Sainte Marguerite, and in the following year contributed greatly to the defeat of the Spaniards before Gattori. He was afterwards in various actions on the coast of Spain. In 1644 he went to serve in Sweden, and was promoted to the rank of vice-admiral of the Swedish fleet. In this station he had a command in the famous battle in which the Danes were entirely defeated, and his vessel was one that boarded and took the enemy's admiral ship. On his return to France he commanded an squadron sent to the expedition against Naples. The French navy being in a low state on account of the minority of the king, he fitted out several ships at his own expense in 1650, with which he sailed in the reduction of Bordeaux, which had revolted, and was aided by a Spanish fleet. In 1676 he had the glory of being opposed to the great De Ruyter. The Spanish and Dutch fleets had united to prevent the French from succouring the inhabitants of Melfina, but Du Quefne, after a desperate fight, succeeded in entering the port. He was also engaged with De Ruyter when the latter was mortally wounded. Du Quefne obtained a more glorious and decided success in another engagement with the Spanish and Dutch fleets at Palermo, when, by means of his fire-ships, he destroyed twelve large ships of the enemy, and thus procured for his king the sovereignty of the Mediterranean. In 1692 he was sent with a fleet to awe the piratical states of Barbary, which had committed depredations on the French coasts, and in the following year he failed to Algiers, and bombarded the town with such fury as nearly to lay it in ruins. In the following spring the admiral anchored before the city, and did not leave it till he had destroyed almost all the buildings, with the whole of the shipping and fortifications, the consequence of which was they were obliged humbly to sue for peace. He struck equal terror into the fleets of Tripoli and Tunis, which were likewise compelled to purchase peace with France by submission. He performed other great and important services for his sovereign, but the recompense due to him on account of all he did was impeded by his firm attachment to the reformed religion in which he was bred, and which the bigotry of the king regarded as criminal. He received, however, the royal gift of a fine estate, which was erected into a marquisate, and gave him a title; and on the repeal of the edict of Nantes, he was the only person exempted from its penalties. This great hero, one of the chief boals of the French navy, preferred an extraordinary degree of health and vigour, notwithstanding the many wounds which he had received, till his death in 1688, when he had attained to the 78th year of his age. He left a son, of whom we shall say a few words.

QUESTE, HENRY DU, was born in 1652, and at the age of fourteen he entered the French navy, and served with great distinction under his father. He was present at the bombardment of Algiers in 1683, and negotiated the peace of Tunis. At the period when the highest prospects in his profession lay before him, his attachment to the Protestant religion caused him, at the repeal of the edict of Nantes, to quit his country and the service, but he refused with indignation the offers that were made him to take a command in the armies of his enemies, and retired to Switzerland. His high reputation raised him to great credit with the Protestant powers, which he employed in engaging them to undertake the protection of his persecuted brethren; and through his means a great number of victims of the most cruel intolerance procured their liberation from the galleys. In 1751 he told his estate in Switzerland, and retired to Geneva, of which he was admitted to the citizenship. Here he died in 1753, respected alike for his learning and piety. As an author he had taken a considerable share in the version of the New Testament published by the pastors of Geneva, and he was author of a work entitled "Refections Anciennes et Modernes sur l'Eucharistie."

QUESTE, FORT DU, in Geography. See PITTSBURG.

QUESTENEL, PASQUIER, in Biography, a French priest of much celebrity, was born at Paris in the year 1634. Having completed his education, and being admitted a member of the congregation of the oratory, he took priest's orders in 1659. From this time he devoted himself, with great diligence, to the study of the scriptures, and of the fathers, and to the composition of books in practical piety. At the age of 28 he was appointed first director of the institution belonging to his order at Paris. The first of his publications was entitled "Moral Reflections upon the Gospels." After this he was employed in preparing for the press a new edition of "The Works of St. Leo," in two volumes, 4to. in which he has given a vast number of notes that
that reflect great honour on the learning of the editor. Its value was enhanced, in the judgment of his countrymen, by his introducing into it an able defence of the sentiments of the Gallican church, in opposition to the pretensions of the church of Rome. This circumstance gave great offence to the papal government, and the edition was condemned in the following year at Rome. On account of his attachment to father de Sainte-Marthe, general of the oratory in France, he was obliged to quit his diocese, and from other unpleasant circumstances he thought it right to withdraw privately from France into foreign countries. He took refuge at Bruxelles, where he continued his "Moral Reflections" on the acts of the apostles, and the epistles. This, with his former work, he published in 1687. He afterwards revised and made additions to the former work on the Evangelists, and printed an uniform edition of the whole in 1693 or 1694, in four vols. 8vo. In the year 1703 the Jesuits, always inimical to the rights and liberties of mankind, and who, to the utter disgrace of the present period, have been but re-established in their powers, availed themselves of their influence with an ignorant and bigotted king of Spain, to obtain an order for the arrest of father Quefin, who was now thrust into a dungeon belonging to the archiepiscopal palace at Bruxelles. From this situation he was unexpectedly delivered in less than four months by the ingenuity of a Spaniard, who contrived to open a passage through the walls of the prison sufficiently large for his escape. Having thus obtained his liberty, he made the best of his way to Holland, where he published several pieces in vindication of himself and writings from charges preferred against both before the ecclesiastical court of Mechlin, and the sentence of condemnation pronounced by the archbishop. In the year 1705 the enemies of Quefin applied to the pope Clement XI. for the condemnation of the "Moral Reflections," to which he acceded, although he had some years before expressed his decided approbation of them, and even wished to engage the author to come to reside at Rome. Such, however, was the pontiff's inconsistency, that he inferred a decree which condemned the "Moral Reflections" in general, but without specifying any particular doctrines which merited such a sentence. At length, at the instigations of the Jesuits, eager in the cause of perfecution, Lewis XIV. joined himself against Quefin, and applied to the pope for a more definite decree; his holiness, for so much wicked as well as most virtuous of the popes have ever been denominates, in consequence of this application, established a congregation of cardinals, prelates, and divines, to enter into a particular examination of the doctrines and maxims which Quefin had advanced. That his work might not be condemned without any efforts on his part to vindicate it from the accusations of his enemies, our author wrote, on this occasion, two letters to the pope, which were safely conveyed to Rome, but Clement did not deign to give a reply. State policy had already determined what measures he should adopt, and, after the seissions of the congregation were ended, he issued the celebrated bull Unigenitus, in September 1713, which pronounced a sentence of condemnation upon 101 propositions extracted from the "Moral Reflections."

Father Quefin spent the last years of his life at Amsterdam, where he formed some Janesinists churches, and published his apologetic and controversial pieces against the bull Unigenitus, and its abettors. He died in 1719, in the 80th year of his age. Independently of his "Moral Reflections," he was author of several other works of high reputation, of which we may mention, a treatise on "Predestination and Grace," in four vols. 12mo. under the fictitious name of fieur German; and "The Discipline of the Church deduced from the New Testament," in two vols. 4to. A list of this author's works may be seen in Moreri.

QUESNOM, FRANCIS DU, called the Fleming, an excellent sculptor, was born at Brussells in 1594. He learned his art under his father, who was a sculptor, and at an early age displayed so much ability, that the archdeke Albert gave him a pension and sent him into Italy. After the death of that prince, he was patronized by the confiable Colonna; and the celebrated Poupin refiding with the confiable at the same time, the two artificers contracted an intimate friendship, and studied together. Quefini formed himself upon the taste of the ancients, and chiefly excelled in making bas-reliefs and models in a small size, representing cupidus and children, to which he gave singular grace and delicacy. He employed himself several years on a marble faint, for the chapel of Loretto, in which he imitated the genuine beauties of the antique. When the canopy of St. Peter's was finished, pope Urban VIII. ordered four colossal statues to be placed in the niches. That of St. Andrew was given to Quefini, and although one of his competitors ventured to affirm that he would only produce a great child, yet when the figure was completed, it entirely effaced his own performance. Notwithstanding the talents of this artist, which were united to much perseverance and industry, he could barely earn a subsistence, and was in a very low state of health and spirits, when, in 1642, Lewis XIII. engaged him as his sculptor, and as the head of an intended school for that branch of art, at a very liberal salary. This change of fortune he was unable to bear, and as he was on the point of letting out, he sunk into a melancholy derangement, from which he never recovered. His death, which happened at Leghorn in 1645, has been imputed, but probably on insufficient evidence, to poison administered by the hand of a brother with whom he lived on very bad terms. He was mild in his manners, but of a reserved disposition. His reputation is chiefly founded upon the exquisite softness which he gave to marble, and the peculiar grace and beauty of his infantile groups, finished with perfect anatomical exactness.

QUESNOM, Le, in Geography, a town of France, in the department of the North, and chief place of a canton, in the district of Avesnes. The place contains 2960, and the cantons, to which belong the east and west divisions, 9099 each, on a territory of 235 kilometres, in 29 communes. N. lat. 50° 15', E. long. 5° 43'.

QUESNOM-sur-Douve, a town of France, in the department of the North, and chief place of a canton, in the district of Lille. The place contains 4062, and the canton 15,047 inhabitants, on a territory of 82½ kilometres, in nine communes.

QUEST, or INQUEST, an inquisition, or inquiry, made upon oath of an impannelled jury. See INQUEST, and JURY.

The word is formed from the French quête, search; of the Latin quaestum, a thing sought.

QUEST, in Hunting, the seeking out of hounds, or the venting and winding of spaniels. See HOUND.

QUESTEMBERT, in Geography, a town of France, in the department of Morbihan; five miles W.S.W. of Rochfort. The place contains 3668, and the canton 12,187 inhabitants, on a territory of 257½ kilometres, in nine communes.

QUESTION, Questio, in Logic, &c. a proposition, whose truth a person being inquisitive about, propoves by way of interrogation to another.

Logical questions are variously distributed; the ordinary
division is into first or primary questions; as, *Quid est?* What is such a thing? And secondary, which arise out of the former; as, *How is it?*

**Question.** Quadrilateral. See Quadrilateral.

**Question, in Law.** The *quæstio de jure* is generally to be distinguished from the *quaestio de facto.*

**Question is also sometimes used for torture;** which fee.

**QUEST-MEN.** Persons chosen yearly in each ward, to inquire into abuses and misdemeanors, especially such as relate to weights and measures.

**QUEST-MEN, in Ecclesiastical Law.** See Sidesmen.

**QUESTOR.** *Questor,* formed of a quæresto, seeking, searching, or collecting the revenues of the state, an officer in ancient Rome, who had the care of the public treasure.

The questorialship, *quaestura,* is very ancient, as having been established under the kings, probably in the time of Romulus or Numa, or at least under Tullius Hostilius. Tacitus (Ann. xi. 22) says, that the first questors were elected by the people, 64 years after the foundation of the republic; but he is of opinion that they had, long before that period, been annually appointed by the consuls, and even by the kings. But this obscure point of antiquity is contested by other writers. Dionysus and Livy date the original of questors about A.D. 269. Plutarch refers the institution to the time of Valerius Poplicola, when he allotted the temple of Saturn for the treasury, and granted the people the liberty of choosing two young men for the treasurers. Afterwards, viz. A.D. 322, two others were created to take care of the payment of the armies abroad, of felling the plunder and booty, &c. for which purpose they generally accompanied the consuls in their expeditions; and they were distinguished by the name of *pergrini* from the other questors, who assumed the title of *urbanii.*

This number continued till the entire conquest of Italy; and then, A.D. 439, it was again doubled. The four that were added refided with the proconsuls and propraetors, in the provinces, where they were employed in regulating the taxes and customs due to the state.

In the time of the republic, the senate appointed questors in each province, to affist the proconsuls, as lieutenants or treasurers, in the administration of the revenues; but, under the emperors, there was properly but one questor, or treasurer-general of the empire; those other inferior or subordi- nate questors were then called aeditants of the questor, *adjutores quaestorum.*

The questor's office was originally confined to the army. They paid the fuldierry, and took charge of monies coming by spoil and plunder, &c.

At length there were new ones erected to reside in the city, and to receive the public money, taxes, tribute, &c. Their number was increased as the empire increased. Sulla augmented it to twenty; Julius Caesar to forty; some being nominated by the emperor, and the others by the people. Tacitus (Ann. xi. 22) seems to consider twenty as the highest number of questors; and Dion (lib. xiii. p. 374) intimates, that if the dictator Caesar once created forty, it was only to facilitate the payment of an immense debt of gratitude. Under succeeding emperors their number was not fixed. Of those, two were appointed for the city, to take care of the public treasury, and to keep the laws and decrees of the senate; the others pertained to the provinces and the armies.

The questorialship was the first office which any person could bear in the commonwealth, and might be undertaken at the age of twenty-four or twenty-five years. Accordingly, the questorialship was called the first step of honour, and the questors, who were generally employed in the provinces abroad, assigned to them severally by lot, no sooner returned from their provincial administration than they took their places in the senate; and from that time forward, from the rank of equestrians, or what we commonly call knights, became senators for life.

The youth and inexperience of the questors, who entered on that important office in the 25th year, engaged Augustus to remove them from the management of the treasury; and though they were restored by Claudius, they seem to have been finally dismissed by Nero. In the provinces of the imperial division, the place of the questors was more ably supplied by the procurators, or, as they were afterwards called, "rationales." But in the provinces of the senate we may still discover a series of questors till the reign of Marcus Antoninus. From Ulpian we may learn, that under the government of the house of Severus, their provincial administration was abolished; and in the subsequent troubles, the annual, or triennial elections of questors, must have naturally ceased.

There was also another kind of questors, called *quaestores particulares,* whose office was to enquire into, and take cognizance of capital crimes, after the consuls had denied their privilege.

**QUESTOR, sacri palatii, or of the sacred palace, was one of the first dignities under the emperors of Constantinople.**

It was this questor that subscribed the receipts of the emperor, and the answers to the petitions and supplications presented to him. He also drew up and signed the laws and constitutions which the emperor thought fit to publish; and took care of the administration of justice.

Some compare his function to that of our lord high chancellor. It was usually one of the jurisconsulti that was charged with this office; it being required, that he should know the laws of the empire, be able to prefer and see them executed, and judge of cases brought by way of appeal before the emperor.

Constantine was the first who erected questors of the sacred palace.

**QUESTUS, or QUESTUS.** See Questus.

**Questus est *nobilis,* a writ of nuance, which, by Stat. 15 Edw. 1. lies against him to whom a house, or other thing, that breeds a nuance, is defended, or aliated; whereas before that statute, the action lay only against him who built the dwelling, or caused the nuance, to the damage of his neighbour.

**QUETIF, James, in Biography, a learned French Dominican monk, was born at Paris in the year 1618.** He embraced the monastic profession among the preaching friars when he was not more than 17 years of age, and having completed his philosophical course at Paris, he was sent by his superiors to Bordeaux, where he studied divinity, and received priest's orders in 1648. He lived to a great age, excelling his talents in various ways, and died in the year 1698, highly respected for his great erudition, his extensive knowledge, and his virtues. He published a new edition of the "Summa Theologica" of Aquinas, in three vols. folio, with notes. He did the same by a work entitled "Concilia Tridentinæ Canonum." He was editor of "The Spiritual and Aetical Letters of Savonarola;" and he published, with his own notes, "The Life of Savonarola," from the Latin of John Picus, count of Mirandula, with considerable additions. He wrote the preface to "The Letters of Peter Morin," which he published from the author's manuscripts; and he also did his treatise "On the Good Life or Abufe of the Sciences." He was author of a considerable part of the work.
work entitled "Scriptores Ordinis Pradicatorum, cum notis Historicis," which was completed by father Echard.

QUESTREVILLE, in Geography, a town of France, in the department of the Channel; six miles S. of Con-
tances.

QUETTEHOU, a town of France, in the department of the Channel, and chief place of a canton, in the dis-
trict of Valognes; nine miles N.E. of Valognes. The
place contains 1,291, and the canton 14,957 inhabitants, on a
territory of 150 kilometres, in 18 communes.

QUETTENBRUN, a town of Austria; eight miles
E. of Laab.

QUETZ, a town of Saxony, in the circle of Leipfic;
two miles S.S.E. of Zorbig.

QUEVACAMPS, a town of France, in the depart-
ment of Jemappe, and chief place of a canton, in the dis-
trict of Tournay. The place contains 953, and the canton 10,264 inhabitants, on a territory of 1074 kilometres,
in 15 communes.

QUEVAUVILLERS, a town of France, in the depart-
ment of the Somme; eight miles S.W. of Amiens.

QUEVE, in Commerce, a wine measure used in
some parts of France. A queue of Champagne contains 384
pintes of Paris, or about 95 English gallons; a queue of
Burgundy contains 432 pintes of Paris, or 107 English gal-
lons.

QUEL, Fr. tail, as applied to the heads of musical
notes; the minim is the only white note with a tail to it, and the
crotchet the first black note with a tail to it.

QUE, in Heraldry, the tail of a beast.
If a lion has a forked tail, he is blazoned by double-
queued.

Queue d'Aronde, q. d. swallow's tail, in Fortification, a
term applied to outworks, when narrower at the gorge than
at the face or front; i.e. where the sides open towards the
champaign, and contract towards the gorge. The name is
occasioned by its resemblance, in figure, to a swallow's tail,
which the French call queue d'aronde.

Of this kind are some fingle as well as double tenails;
and some horn-works whose sides are not parallel.

On the contrary, when the sides are less than the gorge,
the work is called contre queue d'aronde.

Queue d'Aronde, in Carpentry, a method of jointing,
called also dove-tail.

QUEVEDO DE VILLARES, FRANCISCO, in Biogra-
phy, a celebrated Spanish writer, was born at Madrid in 1570.
He became distinguished at an early period for his literary
attainments, and obtained the honour of knighthood, but
indulging his satirical vein too freely against the administra-
tion of count d'Olivares, he was thrown into prison, from
whence he did not make his escape till the disgrace of that
minister. He died in the year 1645, at the age of 75. He
is regarded by his countrymen as having attained to a con-
iderable degree of excellence in most of the different kinds of
composition. His historical poems are said to be characterized
by energy and spirit; his lyrical by sweetness and beauty;
and his humorous poems by ease, pleasantries, and ingenious
invention. His printed works fill three vols. 40. of which
two are occupied by poetry and one by prose. The former
were collected by Joseph Gonzales de Salas, who illustrated
them with notes and differtations. They were published in
1650, at Madrid, under the title of "Il Parnasso Espagnol."

The humorous pieces of Quevedo have rendered his name
familiar in foreign countries, and have been translated
into the English and other languages.

QUEVILLY, in Geography, a town of France, in
the department of the Lower Seine; three miles W. of
Rouen.

QUEULEN, a river of Chili, which runs into the Pacific
ocean, S. lat. 39° 10'.

QUEYPO, a town of Mexico, in the province of Costa
Rica, near the Pacific ocean.

QUEYRAS, a town of France, in the department of
the Higher Alps; 12 miles S.E. of Briançon.

QUETO, a name sometimes given to the river Ava,
at least to that part which runs between Ava and Prom.

QUI, in Rural Economy, a common term frequently ap-
plied to the female of the cow kind of animals while in the
young state. It is the most generally employed in the northern
parts of the country. See Why.

QUI-Calf, a name usually made use of in the northern
parts of the island, to signify a female or heifer calf. See
Why-Calf.

QUI Tam, in Law, is used where an information is exhi-
bited against any person on a penal statute at the suit of the
king and the party who is informer, when one part of the
penalty for breach of the statute is to be given to the
king, the poor, or to some public use, and the other part to the
former or prosector and the party informing prosectors for
the king and himself. The suit is called a qui tam action,
because it is brought by a person, "qui tam pro dominio rege,
&c. quam pro fe ipso in hae parte fequitur." If the king,
therefore, himself commences this suit, he shall have the
whole forfeiture. (2 Hawk. P. C. 268.) But if any one
hath begun a "qui tam" or "popular" action, no other
person can pursue it; and the verdict passed upon the defendant
in the first suit is a bar to all others, and conclusive even to
the king himself. This has frequently occasioned offenders
to procure their own friends to begin a suit, in order to
forestall and prevent other actions; which practice is
some measure prevented by a statute made in the reign of a
prince very sharp-fisted with regard to penal laws, 12 Hen. VII. c. 20; which enacts, that no recovery, otherwise
than by verdict, obtained by collusion in an action popular,
shall be a bar to any other person prosecuted bono fide. A
precedent, says judge Blackstone, that was borrowed from
the rule of the Roman law, that if a person was acquitted of
any accusation, merely by the prevalency of the accuser,
a new prosecution might be commenced against him. Ff. 47:
13. 3. See Information.

QUIA, in Logic, See Reason.

QUIA dominus remiti curiam, in Law. See Recto.

QUIA emprendas, a denomination given to the statute
of Wiltm. 3. 18 Edw. I which directs, that upon all fines or
feoffments of land, the fee-foe shall hold the same, not of
his immediate feoffor, but of the chief lord of the fee, of
whom such feoffor himself held it; and hence it is held that
all manors existing at this day must have existed by immem-
orial prescription, or at least ever since this statute was made:
for no new manor can have been created since that statute;
because it is essential to a manor, that there be tenants who
hold of the lord, and that statute enacts, that for the
future no subject shall create any new tenants to hold of
himself.

QUI improvidit, a superfeoffed granted in many cafes where
a writ is erroneously sued out, or misawarded.

Such is that granted in behalf of a clerk of the chancery
sued against the privilege of the court, in the common pleas,
and pursued to the exigent.

QUIADKOUA, in Geography, a town of Prussia,
in the province of Bartenland; nine miles S.E. of Allerburg.

QUIBBLETOWN, a town, or rather a village of Ameri-
QUIBERON, a fortified town of France, in the department of Morbihan, and chief place of a canton, in the district of L'Orient, situated at the extremity of a peninsula, to which it gives name, opposite to the island of Belle Isle; remarkable for an unfortunate expedition of English troops and emigrants against France, in the year 1795: 17 miles S.E. of Port Louis. The place contains 1916, and the canton 5618 inhabitants, on a territory of 95 kilometres, in three communes. N. lat. 47° 30'. W. long. 3° 21'.

QUIBO, a small island on the outer part of the bay of Panama; it is uninhabited, but affords wood and water for shipping.

QUIBONDO, a small island in the Indian sea, near the coast of Africa. S. lat. 8° 8'.

QUIBOR, a town of South America, in the government of Caraccas; 15 miles S.W. of Segovia Nuova.

QUIBURI, a town of New Navarre; 20 miles S.S.E. of Cáfa Grande.

QUICAPOUX, a river of America, which runs into the Mississippi, N. lat. 43° 4'. W. long. 92° 5'.

QUICARO, a town of New Navarre; 150 miles S.S.E. of Cáfa Grande.—Alfo, a small island in the Pacific ocean, near the coast of Veragua. N. lat. 7° 54'. W. long. 82° 42'.

QUICI, in Entomology, a species of the cerambyx, mentioned by Maregrave.

QUICK, in Gardening, a term applied to signify any fort of young plant, but especially those of the white-thorn kind. By it is also often understood a live hedge, but more properly the shrubs of which live hedge is formed. In a strict sense it is, however, applied to the Crataegus oxyacantha, or hawthorn, the young plants or sets of which are commonly sold by the nursery gardeners under the name of quicks.

In the choice of these sets, tho' which are raised in the nursery are in general to be preferred to such as are drawn out of the woods, as the latter have seldom good roots: many persons, however, prefer them, as they are larger plants than are commonly to be had in the nursery. See CRATAEGUS.

Quick. See Medlar and Pyrus.

Quick-Beam. See Pyrus, and Service-Tree.

Quick-Beam, in Planting, a name given in some places to the tree usually known by the title of mountain-ash. It has been recommended as useful for forming fences, in some cafes, by Dr. Anderfon, and others. Where it is employed in this way, the plants must be kept down to the proper height, by being cut over as often as there may be occasion; and thus encouraging them to throw out lateral branches in a greater abundance, and, of course, induce the fence to become more clofe and thick in its lower parts. By these means a tolerably perfect hedge may be raised, from plants of this fort, in situations where the white-thorn will not succeed in any proper manner.

Quick-Hatch, in Zoology. See Ursus Lupus.

Quick-Hedges, in Agriculture, a name given to all fuchs as are raised from quicks, or any other fort of living plants. The proper forming and planting of quick-hedges have hitherto been much too little attended to by the farmer, as it is a matter of great importance, and which interrelates him in a very high degree. Whatever fort of plants may be employed for this purpose, the work should constantly be well performed in the first instance, and the hedges and plants be afterwards kept in due order and regularity by suitable pruning, cutting in, and other proper management. There is a great number of different methods of raising and making hedges of this kind, as by planting the sets on the plain surface, or the mould a little raised above it, or on mounds, formed by the fods and mould dug up in the line of the hedge, elevated to different considerable heights; by setting the plants out in one row only, in double ones, or sometimes in a still greater number; by putting them in, in straight lines, in irregular manners, in the triangular form, or in the quincunx method. They are sometimes cut over at certain heights, at others not cut down at all; the fides are also in some cafes clipped or cut in, but in others this is avoided altogether. When planted on banks, they are mostly cleaned and moulded up annually.

A great variety of different forts of plants is employed in forming and constructing thes hedges, as those of the hawthorn, the black-thorn, the crab-tree, the hazel, the willow, the beech, the elder, the poplar, the alder, and several other kinds, according to particular circumstances and situations. And on the exposed coasts or shores of the southern parts of the kingdom, a new fort of shrub or plant has lately been recommended for this ufe, which is that of the tamarisk, or tamarix gallica, as it thrives rapidly, it is said, when planted in situations most exposed to the blast or broale of the sea; forms an admirable shelter, and being of quick growth, soon comes to answer the end designed.

The writer of the agricultural report of the county of Cornwall has known a hedge of it, which he has been told was planted about seven years ago, and the bushes, apparently, cannot be left now than from ten to twelve feet in height, and are feathered to the very bottom. It thrives well about the Lizard, bears cutting perfectly well, and in exposed situations, where it might be injured if left to grow high, may be kept clofe and low to much advantage. It unfortunately, however, will not fand the froft, and should never be attempted, of course, in situations exposed to the severe effects of it. The propagation of it is by cuttings, which take root without any difficulty. It is fuppofed that this shrub was brought by the monks from Normandy to Mont St. Michael in the above county, and thence spread to other parts. See HEDGE, and Quickset Hedge.

The quick-hedges of this country are in a very great degree raised from the white-thorn, which unquestionably forms the cheapest and most durable kind, where the nature of the soil, situation, and other circumstances are favourable for the purpose. It will not, however, flourish in bad land, in exposed situations, where the bottom is wet and springy, or where the growth of weeds is very abundant. In all such cafes other kinds of plants are therefore had recourse to in the formation of them.

In many upland districts beech-hedges have been planted to considerable extents, and found, when kept under proper management, to be very handsome, and of great service in such exposures. Birch-hedges have likewise been tried in different cafes, and found to grow remarkably fast, even in cold bare tilly soils, but they require to be cut over at the time they are about four feet in height and carefully ploughed. Both these forts of hedges have this in their favour, that they will grow in very poor soil as well as in very exposed situations; and both will flourish and grow strongly where the white thorn cannot live. Their want of prickles, however, is a great objection to them in this view: but they afford good shelter.

Quick-hedges constitute the ordinary fort of fences in this country, and unless in particular situations, and for particular purposes, are the most proper and eligible. It has been
been observed by the writer of a late work, that in parts which have been long inclosed without arable cultivation, hedges, of seemingly great age, are met with, which are many times crooked, ragged, and irregular, as though they had been, in the first instance, formed and laid out from the wild underwood of such places. While in other cases, low plants of the various copice kinds rise and grow on dikes or mounds but little raised above the surface of the land, seemingly as though they had formerly been collected from brugh-woods and replanted on such banks, in somewhat the same manner as is still practiced on higher banks in particular districts towards the west, and in South Wales. But taking the country at large, the method of raising quick-hedges by setting grown plants taken from such situations, has long ceased to exist and prevail as a general practice; young plants of white-thorn, or other forts, set out in the bank and ditch mode with a low protecting dead fence on the side contrary to the ditch at first, is the plan commonly had recourse to, such plants being first raised in small grounds for the purpose in regular rows, and not taken, as formerly, from brugh-woods and waste commons.

**Quick-Lime,** in Rural Economy, such lime as is in the caufic or mott active flate, and which poifefles the greateft power of operating upon different fubflances with which it may come in contact. It is quite the opposite in its qualities and properties, to that which has fallen down into a powdery flate, in confequence of being faturated with water and carbonic acid gas, or fixcd air, or which is flaked and become effete. Its powers, when applied upon land in this condition, have already been noticed in speaking of lime. See **Lime.**

But it poifefles qualities and properties in the way of a cement, the utility of which for building, for various do-mericl purpoefes, properly belong to this place. According to Dr. Anderfon, lime is in the belt and mott fit flatc for this ufe when the moft perfectly caufic, or in the moft cryftallizing condition. It is remarked, that the powder of lime, when reduced by means of water into a thin or fluid fort of pale-like form, and then fuffered to become dry, concretes into a coherent mafs, which fixes to iones and other rough bodies in a very firm manner, and in this way becomes a proper cement for building any fort of walls. And that, after this pafly material has once become firmly dry, it is quite indiflufible in water, and incapable of ever being caftagain by the caufe of the atmosphere or other similar caufes. Hence it excels many other forts of cements.

When compofed for the purpoef of building walls, &c. it is ufually denominated mortar; but when formed as an application in the way of a smooth coating upon any plain surface without intermixture with ifony matters, it is commonly here termed playfier.

When made from the lime of the purer fort of lime-flone, it is found to be more soft and crumble, and to acquire a fels degree of hardnefs, and to be broken with much fels force, than where the lime-flone from which it is made contains a large proportion of fand, in which cafe it becomes much more hard, firm, and durable.

It has, however, been discovered that the pureft lime may be rendered a firm cement by adding a proper proportion of clean hard fand to it; hence the practice of blending fand with lime, when intended for mortar, has become fo universal. This is fully flown to have been very early the cafe, by the oldest lime-built walls which are now to be met with.

It nevertheless still remains a defideratum to afcertain the due proportion of fand which is neceffary, as both writers and practical masons greatly difagree in opinion on this matter, as well in their directions about the mode of mixing the materials, as of applying the cement; some of the more modern, especially, affuming extraordinary effects to a small variation in these particulars, while others deny that these circumstances have any sensible effeet on the durability and firmnefs of the cement.

It is conceived that these different and contradictory opinions arife from an imperfect knowledge of the nature of quick-lime, and the variations it may admit of; for these variations are fo very great, as to render it impoffible to afford any general rules that can possibly apply in all cafes. It is, therefore, conceived to believe those who are defirous of acquiring any confluent and satisfactory knowledge on this head, to endeavour to afcertain, in the firft place, the circumstances which render calcareous fubflances at all capable of becoming a cement, and then to trace the feveral changes that may be produced upon it by other extraneous caufes.

Having explained the circumstances which cause the differences in lime-flone, and pointed out the different constituting principles of it, as well as various other peculiarities; it is flated that lime, which has in any way abforbed its full quantity of air from the atmosphere and became mild, is altogether unfit for becoming a cement, and that, of cafe, it is evident, that a great change may be produced upon the quality of any lime, by having allowed lefs or more of it to be in this flate before it is worked up into mortar. And further, that if a large quantity of water be put to fresh flaked quick-lime, and beat up with it into a thin fort of pale, the water diffofes a fmall portion of the lime, which as it gradually abforbs its air, is converted into cryftals; between the particles of which cryftals, that part of the lime which was not diffofed, and the other extraneous matters which may have been mixed with it, are entangled, fo as to form a firm coherent mafs of the whole. And that the pafly fubflance formed in this manner, is the well-known article mortar; and this heterogeneous, imperfectly semi-cryftallized mafs, constitutes the common cement employed in building ordinary walls or other erecitions. These circumstances, therefore, being known, it is thought that it will not be difficult to comprehend what are the particulars that are neceffary to form the most perfect cement of this nature. That fine lime becomes a cement only in confequence of a certain degree of cryftallization taking place in the whole mafs, it is sufficiently obvious that the firmnefs and perfection of that cement must depend upon the perfection of the cryftals; and the hardnefs of the matters that are entangled among them; for if the cryftals are ever fo perfect and hard of themselves, if they be separated from one another by any brittle incoherent medium, it is evident that the whole mafs must remain in some degree brittle and incoherent. That as water can only diffofe a very small proportion of lime, even when in its moft perfect fialine or caufic flate, or while it remains deprived of its carbonic acid gas, and as happens in other fimilar cafes, no more of the lime can be reduced to a cryftalline mafs than has been actually diffofed in the water; it happens of cafe, that if mortar be made of pure lime and water alone, a very small proportion only can be diffofed by that small quantity of water that is added to it; and as this small proportion alone can afterwards be cryftallized, all the remaining undiffofed particles of the lime will be entangled among the few cryftals that are formed. And as the undiffofed lime in this mafs will in time abforb its air, and be converted into mild calcareous earth without having had a sufficiency of water to allow it to cryftallize, it must concrete into a friable mafs exactly refembling chalk; it follows, that this kind of mor-
tar, when as dry as it can be made, and in its highest degree of perfection, will always be soft, and easily crumbled into powder.

But that, if, instead of forming the mortar of pure lime alone, a large proportion of sand be added to it, the water will in this case diffuse as much of the lime as in the former; and the particles of hard sand, like sticks or threads, when making sugar-candy or other crystals, while surrounded by the watery solution, will help to forward the crystallization, and render it more pure than it otherwise might have been, so as firmly to cement the particles of sand to one another. And as the granules of sand are perfectly hard of themselves, so as not to admit of being broken down like the particles of chalk, it necessarily follows, that the cement made of these materials must be much more perfect in every respect than the former.

After considering a variety of circumstances in regard to the solubility of lime in water, and its crystallization, it is remarked, that when a large quantity of sand is mixed in the mortar, that sand will of course bear a great proportion to the whole mass; so that the water that may be mixed with the mortar will be much greater in proportion to the quantity of lime contained in this mortar, than if the whole had consisted of pure calcareous matter. And that, as the sand absorbs none of that water,—that water, now pure, is at liberty to act once more upon those few particles of caustic lime that still remain in the mortar, which will be diffused and converted into crystals in their turn. In this way it may happen, in some circumstances, that a very large proportion of the lime may become crystallized; so that the mortar will consist almost entirely of sand enveloped in crystalline matter, and become in due time as hard as stone itself; whereas mortar, consisting of pure lime, without sand, can hardly ever be much harder than chalk. It is not, however, to be supposed, that in any case this dried mortar will assume that transparent crystalline form, or the compact form of some sorts of calcareous matters, such as marble and lime-flour. In mortar, in spite of the utmost care that can ever be taken, a very considerable quantity of the lime must remain undiffused; which undiffused lime, although it may be so much separated by the sand and crystalline lime-flour as not much to affect the hardness of the mortar, yet it must still retain its white chalk-like appearance. As marble and lime-flour are, however, always formed by those particles of lime that have been wholly diffused in water, and from which they have been gradually separated by a more flow and more perfect mode of crystallization, they have nothing of that opaque calx-like appearance, but assume other colours, and appear more firm, uniform, and compact; the sand and other matters that may be enveloped in them being entirely surrounded with a pure crystalline matter.

But to obtain the most perfect kind of mortar, it is not, however, enough that a large proportion of sand should be employed, and that the sand should be intimately mixed with the lime; it is also of the utmost importance that a large proportion of water be added; for without this it is impossible that a large proportion of the lime can be crystallized; and the mortar, in that case, would consist only of a mixture of chalky matter and sand, which could hardly be made to unite at all, and would be little more coherent than sand by itself, and less so than pure chalk. In that case, pure lime alone must afford rather a firmer cement than lime with sand. It is also of very great importance that the water be retained as long in the mortar as possible; for if it be suddenly evaporated, it will not only be prevented from acting a second time upon the lime, after a part of what was first diffused has been crystallized, but even the few crystals that would be formed when the water was suddenly evaporating, would be of themselves much more imperfect than they otherwise must certainly would have been. In proof of which, in cases of the crystallization of common salt, lump sugar, and sugar-candy, are added; after which it is noticed, that every one knows what a difference there is between the firmness of the finest substances; and that as great must be the difference between the firmnofs of that cement which has been slowly dried, and that which has been hastily hardened by the powerful action of a warm air.

It is contended, that it is owing to this circumstance that the lime, which remains all winter in a mortar tub filled with water, is always found to be much firmer and more coherent than the mortar that was taken from the same tub and used in any work of masonry, although in this case the materials were exactly the same. From the same cause, any work cemented with lime under water, if it has been allowed to remain undisturbed and uninjured until it has once become hard, is always much firmer than that which is above the surface of the water.

In order to render the force of the above reasoning more strong and convincing, lime cement or mortar is compared to a mass of matter consisting of a congeries of stones closely compacted together, and united by a strong cementing matter that had, while in a fluid state, pervaded all the interstices between the stones, and afterwards become a solid indiffusable substance. If the cementing matter be exceedingly hard and coherent, and if the stones bedded among it be also very hard and firm, the whole mass will become like a solid rock, without fissures, that can hardly be broken to pieces by the power of man. But, although the cement should be equally firm, if the stone, of which it consists, be of a soft and friable nature, suppose chalk or sandstone, the whole mass will never be capable of attaining such a degree of firmness as in the former case; for when any force is applied to break it in pieces, although the cement should keep its hold, the solid matter cemented by it would give way, and the whole would be easily broken to pieces. Whereas in mortar, the sand that is added to it represents the stones of a solid matter in the composition, the particles of which are united together by the lime which had been formerly diffused, and now crystallized, which becomes an exceedingly solid and indiffusable concretion. And as the particles of sand are of themselves exceedingly hard, and the cement by which they are united equally so, it is plain that the whole concretion must be extremely firm, so as to require very great force to disintegrate any particle of it from the whole mass. But if, instead of employing sand, the only solid body that is entangled among the cementing matter should be chalk, (as in all cases where the mortar consists of pure lime alone,) or any other slightly cohering substance, let the cementing particles of that composition be ever so perfect, it is impossible that the whole can ever attain a great degree of firmness, as these chalky matters will be easily broken afunder.

It is remarked, in addition, that a variety of conjectures have been made about the nature of the lime cement employed by the ancients. It has been thought that they possessed an art of making mortar, which has been long since entirely lost; as the cement in the walls which have been built by them, appears to be, in many cases, much firmer than that which had been made in modern times. Yet, when the mortar of these old buildings is analyzed, it is found to consist of the same materials, and nearly in the same proportions, in which they are now made use of.
QUICK-LIME.

And it is thought probable, that their only secret confisted in mixing the materials more perfectly than the rapidity or avarice of modern builders will permit, in employing their mortar in a much more fluid state than is done now, and in allowing it to dry more slowly, which the immoderate thickness of many of their walls would naturally produce, without any preconcerted design on their part. Tradition has even handed down to the present times the memory of the most efficient of these particulars; as the lower class of people, in every part of the nation, at this moment invariably suppose and believe that these old walls were composed of a mortar so very thin, as to admit of its being poured, like a fluid, between the stones, after they were laid in the wall: and the appearance of these old walls, when taken down, seems to favour this popular tradition. Nor is it doubted but that this may have been the case. The stones in the outer part of the wall, it is thought, were probably bedded in mortar nearly as is practised at present; and the heart, after being packed well with irregular stones, might have the interstices between them entirely filled up with fluid mortar, which would infuse itself into every cranny, and in time adhere as firmly as the stones themselves, or even more so, if the stones were of a sandy friable nature. And that, as these walls were usually of very great thickness, it might often happen, that the water in this mortar, by acting successfully upon different particles of caustic lime, would at length be entirely absorbed by successive crystallizations, so as to become perfectly dry, without any evaporation at all; in which case, a very large proportion of the original lime must have been regularly crystallized in a slow and tolerably perfect manner, so as to attain a firmness little inferior to lime stone or marble itself.

It is supposed that, upon these principles, it is easy to account for the superior hardnes of some old cements, when compared with that of modern times, in which a practice very different is usually followed, without having recourse to any wonderful arcana whatever.

Monseur Loriot, a late French writer, imagined that he had made a perfect discovery of the way in which the ancients employed their quick-lime, so as to obtain such an extraordinary firm cement; from which discovery, he conceived, very important benefits might be derived to society. According to his opinion, the ancient cement consisted of lime and sand nearly in the same proportions as are commonly employed for that purpose at present. But instead of making it of flaked lime entirely, as is done now, he contends that they employed a certain proportion of their lime unsketched, which they mixed with their mortar immediately before it was used. And it is further noticed, that this newly discovered cement dries and hardens almost under the hand of the operator, without cracks or flaws of any sort; that it neither expands nor contracts with the air;—that it is impervious to moisture, and may not only be employed for making roofs of houses that are subject to the continual dripping of water, basins, aqueducts, canals, &c. which will infallibly contain water in any quantities, but even finer works of the pottery kind; that it perfectly refits frosts, and has a variety of other interesting qualities. The trials of Dr. Anderson with the same sort of materials do not, however, confirm the great certainty and utility of this discovery. "That such effects as the writer describes," says the doctor, "will invariably be produced, merely by adding a certain proportion of unsketched lime in powder to mortar, or even by making the mortar entirely with powdered quick-lime, I may without hesitation venture to deny, not only from the reasoning that has been given, but from actual experiment, again and again repeated by myself, and which is likewise, in some measure, corroborated by the experience of Mr. Doffe." On these accounts, it is supposed, that if Monseur Loriot, has really experienced the uncommon effects from the mortar he has tried, it must have been occasioned by some other unobserved peculiarity, and not merely by the circumstance to which he seems to ascribe it. Possibibly the doctor supposes the lime he employed may have been impregnated with a gypsum, or the sulphate of lime, as is probable, for many reasons. The effects and qualities of which, as to becoming a fine powder, and of suddenly setting, are well known, but it never acquires the flinty hardnese that lime cement is sometimes endowed with, although it takes the smoothest polish of any cement we know; on which account, it has long been employed as a plaster where fine ornaments are required.

There are unquestionably, however, many doubtful and mysterious circumstances connected with this matter, which require the aid of further trials and experience in their full explanation.

There are still further a few other circumstances that may influence the quality of common lime-mortar. If lime-flone be sufficiently calcined, it is deprived of all its moisture, and of all its carbonic acid gas, or fixed air. But experience shews, that lime-flone will fall to powder on the effusion of water upon it, when it is much less perfectly calcined, and while it still retains almost the whole of its fixed air. And that as masons have hardly any other rule for judging whether lime-flone be sufficiently calcined, except this single circumstance of its falling to a powder when water is poured upon it, it may thus easily be perceived, that the same lime may be more or less fitted for making good mortar, according to a circumstance that, in a great measure, eludes the observation of operative masons; for if it should happen that all the pieces of lime drawn from a kiln at one time, were just sufficiently calcined to make it fall to a powder with water and no more, that powder would be altogether unfit for making mortar of any kind. This is a case that can seldom happen; but as there are a great many intermediate degrees between that flake and perfect calcination, it must often happen that the flone will approach nearer to one of these extremes at one time than at another; so that the mortar may be much more perfect at one time than at another, owing to a variation in this particular.

All those who have written on the subject of lime as a cement, have endeavoured to ascertain what is the due proportion of sand for making the most perfect cement. But a little attention to the matter will shew, that all rules, which could be prescribed as to this particular, must be so vague and uncertain, as to be of little utility to the practical mason; as, besides the variation which may arise from a more or less perfect degree of calcination as above, it is a certain fact, that some kinds of lime-flones are much more pure, and contain a much smaller proportion of sand than others do; some being found almost perfectly pure, while others contain eleven-twelfths of sand and all the intermediate proportions of it. Therefore it would be absurd to say that pure lime would require as small a proportion of sand when made into mortar, as that which originally contained in itself a much larger proportion of sand than any writer has ever ventured to propose for being put into mortar.

Besides, there are differences caused by the different nature of the calcination in the different sorts of lime-flone, from which it may, upon the whole, be concluded, that
about one-tenth of pure lime-stone is not enough calcined to admit of being made into mortar; and that of the most impure sorts of lime-stone, not above one-fourth of the lime contained in it is so much calcined as to be in a calculic state.

The variation that is produced by these means in regard to the proportion of sand that will be required to the lime in the one or the other case, is found to be so extremely great as hardly to be conceived. It is, however, stated, that the best mortar that has been seen made was formed of lime which had been found to contain eleven parts of sand to one of lime: to this there was added between twice and thrice its whole bulk of sand by measure; which may be allowed to have been at least twice its quantity by weight. Therefore, supposing that every particle of that lime had been so perfectly calcined as to be in a calculic state, there could not be less than forty-seven parts of sand to one of lime. As much may, however, be allowed for the uncalculic part of the lime as is pleased, and the calculation made accordingly. But it is hardly possible to suppose that above one-hundredth part of this mass, independent of the water, consisted of pure calcic calculic earth.

On these considerations it is conceived, that it is impossible to prescribe any determinate proportion of sand to lime, as that must vary, according to the nature of the lime and other incidental circumstances, which would form an infinity of exceptions to any general rule. But it would seem that it might be safely inferred that the moderns in general rather err in giving too little sand, than in giving too much. It deferves, however, to be noticed, that the sand, when naturally in the lime-stone, is more intimately blended with the lime than can possibly be ever effected by any mechanical operation; so that it would be in vain to hope to make good mortar artificially from pure lime, with such a small proportion of calcic calculic matter as may sometimes be effected when the lime naturally contains a very large proportion of sand. But there seems to be no doubt, that if a much larger proportion of sand were employed, and if that were more carefully blended and expeditiously worked than is common, the mortar would be much more perfect than is usual in modern times, as has been proved by actual trials.

Another circumstance that tends greatly to vary the quality of cement, and to make a greater or smaller proportion of sand necessary, is the mode of preparing lime before it is beaten up into mortar. When for platter, it is of great importance to have every particle of the lime-stone flaked before it is worked up; for, as smoothness of the surface is the most material point, if any particles of lime should be beaten up in it, and employed in work before sufficiently fallen, the water, still continuing to act on them after it was worked up, would infallibly flake such particles, which forcibly expanding themselves, would produce those effects on the surface of the platter commonly termed blisters. Consequently, in order to obtain a perfect kind of platter that will remain smooth on the surface and free of blisters, there is an absolute necessity to allow the lime to lie to lie for a considerable time macerating or souring in water, before it is worked up. And the same sort of process is necessary for the lime when intended for use as mortar, though not so absolutely. Great care is, however, required in the management in this respect; the principal things being the getting of well-burnt lime, and the allowing it to macerate or sour with the water for only a very short time before it is used; but that which is the best burnt will require the maceration of some days in the water before it is sufficiently flaked in the whole mass for this purpose. See Souring Lime for Mortar and Plaster.

It has been almost universally admitted, that the hardest lime-stone affords a lime that will consolidate into the firmest cement; and hence generally concluded, that lime made of chalk, produces a much weaker cement than that is made of marble or lime-stone. It would seem, however, that if ever this be the case, it is only incidentally, and not necessarily so. As from the nature of calcic calculic matter, every kind of lime is equally fit for becoming a firm cement, if it be first reduced to a proper degree of caulicity, and has afterwards a due proportion of sand properly mixed with it, before it is employed in work. Different sorts of lime, without doubt, differ much from each other in the proportion of sand they naturally contain, and, of course, require very different proportions of sand to be added to them before they can be made equally perfect as a cement; which is an economical consideration, of no small moment in some cases, as it may make one sort of lime a great deal cheaper than another on some occasions, and, of course, deserves the attention of builders in general. See Lime.

The excellencies and defects of other substances that may be occasionally mixed with lime in making cement may be justly noticed. Those commonly used as an addition to mortar, besides sand of various denominations, are powdered sand-stone, brick-dust, and sea-shells. And for forming platter, where clozeness rather than hardness is required, they are lime that has been flaked and kept long in a dry place, till it has become nearly effeet, powdered chalk or whiting, and gypsum in various proportions; besides hair and other materials of that nature. But some others have been more lately advised, such as earthy balls, slightly burnt and pounded, powdered and sifted old mortar rubbish, and others of a similar kind. All of which substances are found objectionable in some respect or other for this use, being the only perfectly suitable material that can be easily blended on; on which account it has been always justly preferred. Pure form crystallized sand is the best, but all pure sands are not equally proper in this intention. See these substances respectively. See also Cement and Sand.

It is stated by Sir Humphry Davy, in his work on "Agricultural Chemistry," that there are two modes in which lime acts as a cement; in its combination with water, and in its combination with carbonic acid. When quick-lime is rapidly made into a paste with water, it soon loses its softness, and the water and the lime form together a solid coherent mass, which consists of nineteen parts of water, to fifty-five parts of lime. When this hydrate of lime, while it is consolidating, is mixed with red oxide of iron, alumina, or silica, the mixture becomes harder and more coherent than when lime alone is used; and it appears that this is owing to a certain degree of chemical attraction between hydrate of lime and these bodies; and they render it less liable to decompose by the action of the carbonic acid in the air, and less soluble in water. It is thought that the basis of all cements that are used for works which are to be covered with water must be formed from hydrate of lime; and that the lime made from impure lime-stones answers this purpose very well. Puzzolana, it is said, is composed principally of silica, alumina, and oxide of iron; and it is used mixed with lime, to form cements intended to be employed under water. It is stated that Mr. Smeton, in the construction of the Eddystone lighthouse, used a cement composed of equal parts, by weight, of flaked lime and puzzolana. Puzzolana, it is said, is a decomposed lava. Tarraz, which was formerly imported in considerable quantities from Holland, is found to
to be a mere decomposed bafalt : two parts of flaked lime and one part of tarsas form the principal part of the mortar used in the great dykes of Holland. It is supposed that fulbances which will answer all the ends of puzzolana and tarsas, are abundant in the British islands. An excellent red tarsas may be procured in any quantities from the Giant's Causeway, in the north of Ireland: and decomposing bafalt is abundant in many parts of Scotland, and in the northern districts of England in which coal is found.

It is observed that Parker's cement, and cements of the same kind made at the alum-works of Lords Duncas and Mulgrave, are mixtures of calcined, ferruginous, siliceous and aluminous matter, with hydrate of lime.

It is noticed, that the cements which act by combining with carbonic acid, or the common mortars, are made by mixing together flaked lime and sand. These mortars at first solidity as hydrates, and are slowly converted into carbonate of lime by the action of the carbonic acid of the air. It was found by Mr. Tennant, that a mortar of this kind, in three years and a quarter, had regained sixty-three percent. of the quantity of carbonic acid gas, which constitutes the definite proportion in carbonate of lime. The hardness of the mortar in very old buildings is also thought to depend upon the perfect conversion of all its parts into carbonate of lime. The purest lime-flakes are the best adapted, it is said, for making this kind of mortar. The magnetite lime-flakes make excellent water cementes, but act with too little energy upon carbonic acid gas to make good common mortar.

The Romans, on Pliny's authority, made their boil mortar a year before it was used; so that it was partially combined with carbonic acid gas before it was employed, it is supposed.

It is likewise suggested, in regard to the cultivation and improvement of land by means of this material, that quick-lime in its pure state, whether in powder, or diffused in water, is injurious to plants; graves in several instances having been killed by watering it with lime-water: but that lime, in its state of combination with carbonic acid, is a useful ingredient in soils. Calcareous earth is found in the ashes of the greater number of plants; and exposed to the air, lime cannot long continue caustic, but soon becomes united to carbonic acid. That lime, when combined with about one-third of its weight of water, constitutes hydrate of lime; and that it becomes carbonate of lime by long exposure to the atmosphere, the place of the water being supplied by carbonic acid gas. On mixing freshly burnt or flaked lime with any moist fibrous vegetable matter, a strong action occurs between them, and they form a sort of compost, part of which is commonly soluble in water. In this way, lime renders matter, before comparatively inert, nourishing; and from charcoal and oxygen, abounding in vegetable matter, it becomes converted into carbonate of lime at the same time.

Mild lime, or powdered carbonaceous substances, have no action in this way upon vegetable matter; by their operation they prevent the too quick decomposition of bodies previously diffused; but do not tend to form soluble matters. Consequently it is clear that the operation of quick-lime and mild carbonaceous substances, depend upon wholly different principles. The former, on being applied to land, tends to bring the hard vegetable matter contained in it into more rapid decomposition and solution, as a proper food for plants. The latter only improve the texture of it, or its relation to absorption: it is merely an earthy ingredient. Quick-lime, in becoming mild, has a similar action, but while taking on that state, prepares soluble out of insoluble matter. On this depends the operation of lime in the preparation for wheat crops, its efficacy in fertilizing pasts, and in bringing into cultivation all sorts abounding in hard roots, dry fibres, or inert vegetable matter. The question, of course, whether quick-lime should be applied to land or not, depends on the quantity of inert vegetable matter it contains; and that whether mild lime, marle, or powdered lime-flakes, should be used or not, on the quantity of calcareous matter already in the land. All sorts of land are improved by mild lime, and ultimately by quick-lime, which do not effervesc with acids; and the sandy sorts more than the clayey kinds.

In land deficient in calcareous matter, but containing much soluble vegetable manure, the use of quick-lime should constantly be avoided, as tending either to decompose the soluble matters, by uniting to their carbon and oxygen, in becoming mild, or to combine with the soluble matters, and form compounds with less attraction for water than the pure vegetable substance. The fame is the case in regard to most animal manures; but its operation is different in different cases, according to the nature of the animal matter. On the whole, it should however never be employed with animal manures, except when too rich, or for preventing noxious effluvia. It is hurtful in mixture with common dung, and tends to produce infoliabillty in the extractive matter. It is useful in mixture with simple vegetable barks, &c.

The solution of the question about the inutility and disadvantage of magnesian lime, which has lately been found useful in small quantities on the poorer lands in Leicestershire, as from twenty-five to thirty bushels the acre, and in larger ones, on the rich soils; it is supposed to depend upon that fort of lime having a less attraction for carbonic acid than the other, in consequence of the portion of that substance in it, and thereby remaining longer in the caustic state; and its becoming sooner a carbonate of lime in the rich than in the poor soils. Magnesia, while in the caustic state, is poisonous to certain kinds of plants, and acts in the mixture as lime. It may be usefully applied in large quantities to peat-earths; and to lands injured by too much of this fort of lime, peat-earth will be a proper and effectual remedy, when used in a suitable proportion.

More full information may be met with in this curious and interesting subject, in the first volune of Anderson's Essays on Agriculture and Rural Affairs, in Dörfle's Memoirs of Agriculture, vol. ii. and in Sir Humphry Davy's "Agricultural Chemistry."

Quick-Manure, a term sometimes applied to that fort which is sowed over crops upon the surface of the land, such as foot, small dung, different kinds of ashes, &c. As manures in this intention on pasture lands, wheat, clover, tare, and other similar crops, twenty bushels of foot is recommended to the acre, sixty bushels of rabbit or poultry dung, and fifty of pigeons' dung and ashes; but much larger as well as smaller proportions are made use of in different circumstances. The foot and dung should be sown over the crops about the middle of March, the ashes in February, and all in the most equal and exact manner possible, as much depends upon this being properly performed. See Ashes, Dung, and Soot.

In different counties there is much difference in the use of substances of these kinds in this way as manures. In Hertfordshire the usual quantities of foot employed in this manner are from about twenty to forty bushels, on the wheat crops; but in some places they are used to the extent of fifty or more on the acre. The application of this material is universal throughout almost every parish in the whole county, in this mode and intention. Ashes in the same district are considered by some as rendering the soil more light and open, without contributing, in any great degree,
to the nutrition of the crops over which they are sown. The proportions in which they are used to the acre over the clover, and occasionally the wheat crops, are from fifty to one hundred bushels. They are supposed to be very serviceable to the two clover crops, and greatly beneficial to the succeeding wheat one, by some persons; but others are of quite the contrary opinion, thinking them of very little use to the wheat, except by increasing the quantity of the clover. They are also useful in destroying mosls in the surface of grass lands. They are to be kept dry, and commonly sown over the crops in November or January in mild moist weather.

In Oxfordshire, peat-ashes are made use of from about twelve to forty bushels upon the acre; and those of coal from sixteen to upwards of fifty. They are sown over the wheat, clover, saffron, and turnip crops, the coal being somewhat on the clovers, and the peat on the turnips.

In Berkshire, peat-ashes are used very generally for most of the crops, except wheat, barley, and peas, either sown with the fellows and harrowed in together, or sown on the land as a top-dressing, only; but they are more preferred for all sorts of artificial grass crops, and on natural meadow and pasture grasses, as well as turnips. The quantities employed are from fifteen to twenty bushels and upwards on the acre. They are applied in March or April, several acres being capable of being sown in the course of the day. They only last about a couple of years in the land. The ashes of bean fubble are likewise found beneficial heretofore, bringing up white clover when put upon the grass lands.

Different sorts of ashes have been found very useful on the grass lands in Suffolk, at the rate of from twenty to thirty bushels on the acre, employed as a manure.

In Essex coal-ashes are laid upon the clover, saffron, and grass crops to the quantity of fifty bushels on the acre or more, with very great effects in promoting their increase.

In the county of Hertford they manure for turnips and some other crops with rabbit and poulty dungs, at the rates of from fifty to sixty bushels or more on the acre, with good success. And in some part of the Oxford district, pigeons' dung is found an excellent manure when thrown over the young barley crops, mixed with that of poultry. In Essex too, it is found beneficial for promoting seed when sown over the rape or cole crops in the proportion of eight bushels to the acre.

There are several other articles which are occasionally thrown over crops on the surface of the land as a manure, in this intention, such as those of the duff of malt, rape-cake, bones, phialer of Paris, and some others. Malt-duff is made use of on wheat and barley in many parts of the county of Oxford, and on the young wheat in Hertfordshire, in the quantity of five quarters to the acre. In Berkshire thirty bushels per acre. Rape-cake duff is also used in the former of these last counties on the wheat with success. Pounded bones are likewise greatly beneficial when strewed over the grasses and some other sorts of crops, being sometimes a very forcing manure, and at the same time killing. The phialer of Paris has been used on clover, saffron, lucerne, and other crops with immense effect, in some parts of Oxfordshire, sown over them about March, to the quantity of six bushels per acre. But in Suffolk, in the proportion of eight bushels to the acre, when sown over natural grasses, bean, potato, pea, and barley crops, it had not the least good effect. Nor even when tried on other sorts in the quantity of six bushels to the same extent of land.

Powdered oil-cake that has been spoiled by keeping, is an excellent application as manure in the above way. The fame is also the cafe with chopped tanners' hair, which has been found superior in this use to either malt-duff or any fort of calcarceous matter. Horn-leadings are likewise very beneficial when laid on in this manner to grass lands, in the proportion of from fifty to one hundred bushels to the acre, lasting five or six years, and being of very easy carriage they should be employed in damp weather about February or March. See Manusure.

All these different sorts constitute excellent quick forcing manures, when applied in some of these ways for some of the above purpofes, and should be much more generally employed in such methods than is at present the cafe.

Quick Match, in Artillery, is formed of three cotton threads drawn into length, and dipped in a boiling composition of white wine vinegar, falt petre, and mealed powder. After this immersion, it is taken out hot, and laid in a trough where some mealed powder, moistened with spirits of wine, is thoroughly incorporated into the twists of the cotton, by rolling it therein: thus prepared, they are taken out fervently, and then through the mealed powder, and then hung upon a line to dry. There is also quick match made of worf tide instead of cotton. For its use, see Fire-Ship.

Quick with Child, in Law. See Reprieve.

Quick Pulse, in Medicine. See Pulse.

Quick Sand, in Sea Language, denotes a loose quaking sand, into which a ship sinks by her own weight, as soon as the water retreats from her bottom. See Quicksand.

Quick Thorn, in Agriculture, a name formerly applied to young plants of the hawthorn or white-thorn kind, which are fit for being planted out for the purpose of forming a hedge-fence. See Quicks, and Quickset.

It also signifies this fort of thorn generally.

QUICKEN TREE, in Gardening, the common name of a tree of the ornamental fruit kind. See Sorbus.

QUICKENING, in Midwifery, the first perception women have of the motion of the fetus. This usually happens in the third or fourth month of pregnancy. It has puzzled physiologists to explain why the motion of the fetus should not be perceived earlier, as it is endowed with life from the first moment of conception. But, besides that the parts of the fetus are too soft and tender to affect the uterus by its motion, the membranes enveloping it are too thick, and there is then a proportionally larger quantity of fluid in the ovum than afterwards, which keeps the embryo from touching the sides of it. The uterus also during this period is confined in the cavity of the pelvis, which being of small capacity, and every way surrounded with bones, leaves little room for the motion of the fetus. But as soon as the uterus emerges into the cavity of the abdomen, it readily yields to the motion of the inflating fetus, and the parts by which it is now surrounded being extremely deli- cate and tender, they are affected by the slightest flitting of it. In some women of delicate habits, the moment of quickening is marked by a slight hysteric paroxysm. In thefe cases it seems probable, that the uterus has been suddenly into the abdomen, but ordinarily it rises slowly and gradually, whence the shock on the bowels is so incon- siderable, as scarcely to make any sensible impression. See Conception.

QUICKING-Drag, in Agriculture, a name sometimes given in different districts to the couch and quitch drag. See Drag.

QUICKJOCK, in Geography, a town of Sweden, in the Lapmark of Lutec; 15 miles N.W. of Lutec. N. lat. 69° 20'. E. long. 17°.
QUICKS, in Agriculture, a name commonly given to the young fps of the white-thorn, which are used in planting hedges of that sort. See Quickset Hedge.

It is thought to be indispensably necessary to the success of this sort of fets, as hedge plants, in every situation, that they be well provided with roots and root fibres of the healthy kind, by Mr. Nichol, who has had much experience upon the subject. And this is best secured by taking them from a seminary of rich mould at the end of the first or second year, according to their strength; and nursing them, after that, likewise in rich earth, for one or two sasons longer at the fart: but, in the latter case, removing them into fresh rows at the end of the first year. It is contended, that plants of this age, and thus treated, will outgrow those of greater size in any fort of foil or situation. This has been repeatedly proved by impartial trials; and the caufe, it is supposed, is obviously this, that small plants, even by the fame treatment, are raised with better roots, in proportion to their items, than large ones. Therefore in the choice of quicks, regard should be had to the roots, not the tops of the plants. Their being nurfed the fennon previous to their being removed for hedging purpofes, in rich mellow earth, and being allowed a [ficiency of room, kept clear of weeds and other matters, is the fett mode of preparation, it is imagined, that can possibly be adopted.

There is, however, it is maintained, a double advantage in making use of young plants of this nature. They are cheaper and fitter for exposed situations than thofe of older growths; not becaufe their tops are less bulky, which, fince they are to be cut over about half their lengths before being planted, is immaterial, but becaufe they have better proportioned roots to the fize and Strength of the items, and of courfe are better fitted to feed palturage for their common fuffence and support.

The items of the plants, as has been fugged above, fhould be cut over about half their lengths, or, in general, about six inches above the ground mark: an operation which may be performed by the common hedge fhears, a large sharp knife; or by gathering a handful of them eveny, and laying them upon a block or other familiar body, and chopping them off by means of a hatchet. They fhould always be carefully fifted, and even the smalllef fibre be retained. And at all times, until replanted, the roots fhould be exposed as little as possible to the air or atmosphere. See Quickset.

Quick is also a term sometimes applied to the weed called couch-gras, in different places, and which is of a very troublesome nature, not being extirpated out of the land without much difficulty. See Couch.

QUICKSAND, any fort of spot or bed of running fand, either near to the surface of the foil, or at any depth below it, which has a finking quaggy feel under the root at certain times or feafons, in confequence of containing certain proportions of water. The writer of the work on "Laided Property" has remarked, that they are for the most part topical, and in general only temporary, commonly appearing in and after wet feafons only; clofing and becoming firm when their supplies of moisture are exhausted by long drought. In thofe fites the surfaces are free from the deposition of the mooy earth of bog plants, which demand a conftant coolness, if not a perpetual supply of moisture, being caused by heads or small beds of fand or gravel rising through firmer frata to the surface. They are of courfe apt to be farked in dry hot feafons. In order to remove them, the fame writer advises, that the centre of the part which is aflecd fhould be marked out when the feafon is wet, in order that a drain may be cut, when it is dry, of a fufficient depth quite up to the mark, letting it have the neceffary defcent, and then filling it with suitable materials to admit of the water being conveyed off as it is collected in the flub-foil. When the defect has been thus removed, where it is situated in the area of a field, it is a good practive to cover the part by foil of the fame nature as that of the field where it is situated, by bringing it from thofe parts which are the moft elevated, as by this means it may be rendered of an uniform quality with the reft, and of courfe have a better appearance, as well as be more advantageous in the growth of crops.

Dangerous tracts and spots of this nature are frequently found in marshy and sandy lands, which are occasionally covered by the tides. And large deep beds or layers of quick or running sand are often met with in digging pits, quarries, mines, and other forts of shafts, to great depths under the ground, and cause much trouble and dificulty in getting on with fuch kinds of work, on account of the quantities of water which they contain and let pafs off into them: thus occafioning the neceffity of much difficult drainage, and other inconveniences. See Quarries, Pits, &c. Draining of.

QUICKSAND BAY, in Geography, a bay on the west coast of North America. N. lat. 45° 50'. W. long. 124°.

QUICKSET, in Agriculture, a term generally applied to the white, or hawthorn plant, the fets or young plants of which are raised by nurferymen for fale, for the purpofe of planting and forming hedge-fenees. The roots of the thorn will, however, anfwer equally well, and in fome cafes much better, as there is a certainty of their being of the right fort, or fuch as have prickles upon them, which does not always happen in uifing the quicklets, as they are liable to diaparre when raifed in this method, but which is never the cafe in the root-mode. See Fence-Thorn, and White-Thorn.

Young plants of the quicklet kind are belf raifed in small portions of ground fett apart for them; in which, after they are come up from the feed to fome height, they fhould be tranplanted in lines at narrow diftances, in a ftraight manner, with fmall intervals between the rows; where they are to remain from three to five years or more, being annually well cleaned and moulded up. Some, however, tranplant them more than once, and think it an advantageous way, but they do well in either method. Well grown plants, with ftout clean items, are the moft proper for planting out as hedge plants.

QUICKSET Hedge, a name given to all forts of hedge-fenees which are confituted of any fort of living plants, but more especially of thofe of the white-thorn kind. Hedges of this nature compose the principal feneses of this country. In the drier and better forts of foil, thofe of the thorn kind generally prevail; but in moft other fitations, thofe of fome other forts of plants, according to the particular nature of the fols and exposure. The quicklets or quickfets of the thorn forts are commonly fuppofed to form the bent hedges, when planted in the raifed bank or dike method. The manner of placing them out in these is different in different cafes, both in regard to the form and number of the rows, as well as the diftances of the plants from each other. Some think one regular or irregular row the moft proper, others prefer two ftraight ones; and some fuppofe a few inches diftance from plant to plant the moft benefcial; while others think eight or nine inches to be much better. Strong well-grown quicklets are commonly preferred in all cafes. It is remarked in the Essex Report, by one of the perfons engaged in drawing it up, that in the
parish of Birdbrook, in the north-east part of it, "some excellent hawthorn hedges have been lately raised, by planting one row only at six inches asunder, rather than two rows nine inches or a foot apart. The hedges have not been cut down, nor do they require it, to thicken their bottoms, as they are, at this time, a complete protection against hogs, and in other respects form a beautiful and effectual fence. Nothing can be more evident, it is thought, than that a row of plants set thus . . . . six inches distant from each other, will form a more complete and effectual fence at the bottom, than an equal number planted thus . . . . at a double distance, and occupying the same length, but a greater depth of ground upon the hedge row." This reasoning of Mr. Vancouver's, Mr. Young observes, may, for aught he certainly knows, be conclusive, but it strikes him in a different light. It is true, that the plants in each row are, in the latter mode, at double the distance from each other than they are in the former; but it is to be observed, that in the double row, the plants are diagonally as near each other as in the single row, and, consequently, there is the same vacant space for any animal to pass through in the single row as in the double; and what must be a great advantage to the latter, the plants will shoot out their branches laterally on the outside at least, just as those in the single row, and twice as far lengthwise, meeting with no obstruction in their progress. Of course, it is naturally to be concluded, that the double-rowed plantation must form a fence, if not altogether twice as strong and secure, yet vailly stronger and fiercer than the single one. He does not, however, presume to fet speculation against fact, as he has not seen the hedge noticed above, while Mr. Vancouver has. He has, however, himself planted one in a single row, as above described and recommended; the plants have grown well; the hedge is a good one, but would, he thinks, have been till better, if there had been two rows instead of one, as some others are that he has of that description.

In Sulixe, the quickset hedges at Goodwood are capital, and deferving of every attention, being raised and trained in a most mallerly manner. The duke of Richmond planted them about eighteen or twenty years ago. They surround a very considerable farm, and are in a wonderful state of preservation. They form an excellent fence, without the alliteration of any ditch, bank, rail, or pale; confid of three rows of white-thorn plants, which spread three or four feet at bottom, but are clipped regularly and gradually to a thin edge at top; the shoots are fo numerous, and trained with such care, that even in winter, without a leaf, the thicknes is uncommon. By the young hedges now in training, it appears that one method purfued has been to plant the centre row first, and when that is well established, to add another on each side of it; at least this is done in these new hedges. They are kept in a flate of garden cleaness; the branches are drawn into the line desired, by being tied with mat, or other lines, and the clipping done with the exactest attention; the union of the hedges with the gate-polls is close and pefect, and as to gap, &c. there is no such thing. How they have been preferred from cattle, but especially from heep, is marvellous, if either are ever allowed to enter these clofes; an attention never ceasing, and a boundless expense, fo far as neceffary, mull have been exerted. They cannot be recommended to the imitation of farmers on account of the trouble and expense of them, but they are beautiful as an object to the farming eye, and for their perfection, they merit all that can be laid of them.

On the Walburton farm in the same district, there are some very good quickset hedges, which were planted about twenty-three years ago; the quick was set about two inches asunder, and single; they are cut twice in a year; are four and a half feet high, and two feet thick. There is very little ground boil by the hedge, as it occupies only four feet. The fame excellent fort of quickset hedges has also been made in some other places.

Here two rows of white-thorn plants are common, which are put on the bank of the ditch, care being taken not to have them too near it, for fear of its draining them too much and preventing their growth. In some districts, where the cultivation is principally of the arable or tillage kind, and in exposed upland situations, there is frequently a great prejudice and objection to the introduction and formation of any fort of live hedges, whether of the quickset or any other description, as they take up much space, harbour birds and insects, greatly shade the grain, and tend to promote blight, rust, and mildew, by preventing the free circulation of air. Also in bleak exposures they are not raised without great difficulty. Such objections, however, speedily vanish where they are kept sufficiently low and well cut in and trained on the sides. See HEDGE and FENCE.

QUICKSILVER, a very ponderous fluid mineral, by the chemists called mercury. For the method of gaining, preparing it, &c. with its properties, uses, &c. see MERCURY.

Quicksilver, when rubbed down and blended with unctuous matters, forms a fort of ointment, which is useful in the curing of different diseases of the cutaneous kind, as well as in destroying lice and other vermin that infest animals of different kinds, which form the live-stock of the farmer.

It has also been flated on the authority of Mr. Bradford, as communicated to the Society for the Encouragement of Arts, &c. to have been found useful in its crude state in destroying insects on fruit trees. On a plum-tree he made the following trials; he took a small awl, and pierced, flogging, through the rind, and into part of the wood of the branch, but not to the heart or pith of it; and poured in a small drop or two of the quicksilver, and flogged it up with a small wooden plug, made to fit the orifice: and the result was, he says, that the insects all dropped off from that very branch the next day; and in a day or two more, from off the other branches of the tree, without any other punctures; and the tree continued in full vigour, and throve well all the summer after. Encouraged by this success, he next tried it upon a honey-fuckles, the leaves of which were quite covered with them; and there he scraped away the top of the ground with a trowel, and run his awl, in the same flogging manner, into the main stem, just above the roots; but with the fame caution as above, not quite to the inner pith; and the success was the same as before. The insects all dropped off dead the next day after the experiment was made.

These trials are said to have been confirmed by other experiments; but they are still in want of full and satisfactory confirmation.

QUICKSILVER, Virgin. See VIRGIN.

QUICKSILVER WATER. See WATER.

QUICKSTADT, in Geography, a town of Norway, in the province of Aggerhus; 42 miles N. of Christiania. QUICK-WORK, in a Ship, is a general name given to all that part of a ship which is under the surface of the water, when the same is laden for a sea-voyage. The term is also applied, occasionally, to that part of the side which is above the sheer-rail, and which is usually painted with trophies, &c. on the outside. Falconer.

Quick-work is likewise applied to the frakes that shut in the infide, between the sparsitting and clamps.
QUID, What, in the Schools, is used to denote the definition of a thing.

It is thus called, because the definition answers to the question, quid est? what is it?

Hence we have two kinds of quids; nominal, quid nominis; and real, quid rei.

Quid juris clamat, in Law, a writ that lies where I grant the recovery of my tenant for life by fine in the king's court, and the tenant will not attorn; then the grante shall have this writ to compel him.

This writ seems to be obsolete, since the fourth and fifth of Anne. See Atournment.

Quid pro quo, q. d. what for what, denotes the giving one thing of value for another; or the mutual consideration and performance of both parties to a contract.

Quid pro quo, or Qui pro quo, is also used, in Physic, to express a mistake or cheat of an apothecary, in administering one medicine for another; or in using an ingredient in a composition different from that prescribed.

A northern physician, in a printed thesis on quid pro quo, owns ingeniously, that they are very frequent. He distinguishes very accurately a great variety of kinds of quid pro quo; some with regard to the operation, others with regard to the subject; and others with regard to their form, or effects.

The first comprehends the quid pro quo of the physician; the second, theoé of the patient; the third, theoé of the apothecary.

Quid Lo, a term which signifies the loss of the ruminant power in animals of the live-stock kind. It is mostly produced by local weakens of the stomach, caused by eating improper coarse kinds of food in too large quantities, or other similar means. It may be best restored by the use of strong acids of the vegetable and other kinds, and its return prevented by strong bitter infusions, as theoé of gentian, bark, &c. See CU.

QUIDDEINEN, in Geography, a town of Prussia, in Oberland; 6 miles S.E. of Holland.

QUIDDENY, Quiddiny, (of the Latin cydonium, or cydonium,) a conserve of quinces, called also marmalade.

QUIDDITY, Quidditas, in the Schools, a word of the same signification with essence.

The name is derived hence, that it is by the essence of a thing that it is take quid, such a quid, or very thing, and not another. When upon seeing, or hearing, the name of a thing, with whole nature, &c. we are unacquainted, we ask, Quid est? What is it? We mean no more by the interrogation, but that we desire to have its nature and essence explained by a definition. Whence quiddity is usually defined the essence known or expressed in a definition.

And hence what is essential to a thing is said to be quidditive; as quidditative knowledge, &c.

QUIEBOU, in Geography, a town of France, in the department of the Channel; 5 miles S.W. of St. Lo.

QUIEN, Michael le, in Biography, a learned Dominican monk, who flourished in the latter part of the 17th and in the 18th century, was born in the year 1661. He received a liberal education, having been instructed in classical learning at his native place, and he was then sent to study philosophy at the college du Plessis, at Paris. At twenty years of age he determined to renounce the world, and took the habit in a Dominican convent. Here he studied with uncommon facility and proportionate success, the Greek, Hebrew, and Arabic languages, criticism, divinity, the sacred scriptures, and ecclesiastical antiquities. In the year 1690 he first appeared as an author, by publishing "A Defence of the Hebrew Text and the Vulgate Version," against a work, entitled "The Antiquity of Time restored," written by father Pescor. The latter having published a reply, Quien anwered in a work entitled "The Antiquity of Time exploded." He next attacked him in "Remarks" on his "Attempt at a literal and historical Commentary on the Prophets," printed in the Memoires de Trevoux, for March 1711. During the following year he published "S. Ioannis Damasceni Opera quae extant Gr. et Lat." in 2 vols. fol., accompanied with diffutations abounding in erudition. He intended to have given a third volume, containing such pieces as had been falsely attributed to that father, but it was never sent to the press. The same fortune has attended his labours on "The Works of Leo of Byzantium," to which he had paid a considerable share of attention. Towards the close of his life he entered into a controversy with father Courayer, concerning the validity of the ordinances of the church of England, in which the palm of victory was given to his opponent. Le Quien died in 1753, at the age of 72 years, respected for his piety, and uniform correctness of conduct. He was author of various "Dissertations" to be found in Defmolets "Memoires de Litterature et d'Histoire," and the "Mercure de France." At the time of his death he was engaged in printing the most considerable of his works, relating to the ancient and present state of the eastern churches. "His plan includes the whole of his churches, under the four grand patriarchates of Constantinople, Alexandria, Antioch, and Jerusalem; presents a geographical description of each diocese, and of the episcopal cities, and then gives a particular account of the origin and establishment of the churches, their extent, their jurisdiction, their rights, their prerogatives, the succession and order of their bishops, their political government, the changes which they have undergone," &c. As the author did not live to finish his work, it was published with additions, in the year 1740, under the title of "Michaelis le Quien Orientis Christianus, in quatuor Patriarchatus dignitums, quor exibentur Ecclesiæ Patriarchæ, cæteris Prefeula Orientis," &c. in 3 vols. fol. Moreri.

QUIENFIORD, in Geography, a bay on the coast of Norway; 27 miles N. of Christiania.

QUIENS, a river of Norway, which runs into the sea, 18 miles N. of Cape Lindeiæs.

QUIESCENT, something at rest.

QUIETISM, in Ecclesiastical History, the sentiments of the Quietists, a religious sect, which made a great noise towards the close of the 17th century.

Molinos, a Spanish priest, who died at Rome in the prison of the inquisition, pales for the author of Quietism; and yet the Illuminati in Spain had taught something like it before.

A sect similar to this had appeared at Mount Athos, in Thessaly, towards the close of the fourteenth century, under the appellation of Hesychasts, which denotes the name with Quietists. These were a branch of the Mystics, which fect, or those more perfect monks, who, by a long course of intense contemplation, endeavoured to arrive at a tranquility of mind entirely free from every degree of tumult and perturbation. These Quietists, in conformity to an ancient opinion of their principal doctors, (who imagined that there was a celestial light concealed in the deepest retirements of the mind,) used to fit every day, during a certain space of time, in a solitarie corner, with their eyes eagerly and immovably fixed upon the middle region of the belly, or navel; and boasted, that, while they remained in this posture, they found, in effect, a divine light beaming forth from the soul, which diffused through their hearts inexplicable sensations of pleasure and delight. To such as inquired what kind of light this was, they replied, by way of illustration, that it was the glory of God, the same celestial radiance that surrounded Christ.
Chrrl during his transfiguration on the mount. Barlaam, a monk of Calabria, from whom the Barlaamites derived their denomination, tyed the monks, who adhered to this institution, Maffalian and Euchites: and he gave them also the new name of Umbilican. Gregory Palamas, archbishop of Thessalonica, defended their cause against Barlaam, who was condemned in a council held at Constantinople in the year 1341.

The name is taken from a fort of absolute reft, and inaction, which the soul is supposed to be in, when arrived at the state of perfection, which in their language is called the unitive life. To arrive at this, a man is first to pass through the purgative way; that is, through a course of obedience, infpired by the fear of hell: hence he is to proceed into the illuminative way, before he arrives at perfection.

The sentiments of the Quietists, with regard to God, are wonderfully pure and disinterred. They love him for himself, on account of his own perfections, independently of any rewards or punishments: the soul acquiefces in the will of God, even at the time when he precipitates it into hell; in so much that instead of flomping him on this occasion, B. Angelo de Foligny cried out, "Haftte, Lord, to call me into hell: do not delay if thou hast abandoned me: but finish my destruction, and plunge me into the abyss.".

At length the soul, after long travail, enters into rest, into a perfect quietude. Here it is wholly employed in contemplating its God; it acts no more, thinks no more, defires no more; but lies perfectly open, and at large, to receive the grace of God, who by means thereof drives it where it will, and as it will.

In this state it no longer needs prayers, or hymns, or vows; prayers where the spirit labours, and the mouth opens, are the lot of the weak, and the imperfect: the soul of the faint is, as it were, laid in the bosom, and between the arms of its God, where, without making any motion, or exerting any action, it waits, and receives the divine graces. It then becomes happy; quitting the exilence it before had, it is now changed; it is transformed, and, as it were, sunk and swallowed up in the Divine Being, insomuch as not to know or perceive its being distinguished from God himself. Penel. Max. des Saints.

QUIETISTS, the disciples of Mich. de Molinos; or the adherents to the opinions delivered in the article Quem. The sentiments of Molinos were contained in a book, which he published at Rome in the year 1681, under the title of the "Spiritual Guide": in consequence of which he was cast into prison in 1685, where he was soon obliged to renounce, in a public manner, the errors of which he was accused: and this solemn recantation was nevertheless followed by a sentence of perpetual imprisonment, from which he was in an advanced age delivered by death, in the year 1696. Molinos had a considerable number of disciples in Italy, Spain, France, and the Netherlands. One of the principal patrons and propagators of Quietism in France, was Marie Bouvieres de la Mothe Guyon, a woman of fashion, remarkable for the goodness of her heart, and the regularity of her manners; but of an unsettled temper, and subject to be drawn away by the seduction of a warm and unbridled fancy. This female apostle of mysticism derived all her Ideas of religion from the feelings of her own heart, and described its nature to others as she felt it herself. Accordingly, her religious sentiments made a great noise in the year 1687; and they were pronounced unfound, after accurate examination by several men of eminent piety and learning; and professedly confuted, in the year 1697, by the celebrated Bossuet. Hence arose a controversy of great moment, between the prelate last mentioned, and Fenelon, archbishop of Cambry, who seemed disposed to favour the religiously infen Madame Guyon, and who, in 1697, published a book, cited in the last article, containing several of her tenets. Fenelon's book, by the interest of Bossuet, was condemned by the year 1699, by Innocent XI. and the council of condemnation was read by Fenelon himself at Cambry, who exhorted the people to respect and obey the papal decree. Notwithstanding this seeming acquiescence, the archbishop perilled, to the end of his days, in the sentiments which, in obedience to the order of the pope, he retracted and condemned in a public manner. See the article Fenelon.

QUIETO, in Geography, a river of Ilfria, which runs into the Adriatic, two miles W. of Bafia.

QUIETUS, fixed or acquifited, a term used by the clerk of the pipe, and the auditors in the exchequer, in their acquittances or discharges given to accountants, which usually conclude with the words abinde reeetfis quietus; which is called a quietus eft.

A quietus eft Granted to a sheriff, discharges him of all accounts due to the king.

QUIFORD, in Geography, a district of Africa, on the Gold Coast.

QUIIGNONES, Francis de, in Biography, an eminent Spanish cardinal in the 16th century, who embraced the religious life at an early age, in a monastery of Franciscans, and subsequently afforded such evidence of superior talents, that he was elected general of his order in the year 1522. He obtained the office of confessor to Charles V. and upon the capture of Rome by the imperial army in 1527, and the imprisonment of pope Clement VII. in the castle of St. Angelo, his services were solicited by that pontiff, in negotiating for his liberty, and were afterwards rewarded with a cardinal's hat. After this, he was by the fame interest nominated bishop of Currila, and lent in the capacity of apolitical legate into Spain, and the kingdom of Naples. He died in the year 1540. He was author of a reformed brevity printed at Rome in 1536, which met with the approbation of popes Clement VII. and Paul III. but it was afterwards suppressed by Pius V.; hence it has become rare, and is sought after by collectors. Several spurious editions have been printed at different times. It is inserted in the "Annales Minores" of Wadingus, and in the second edition of Joly's treatise "De Reformandis Horis Canonicos."

QUIJUBATUI, in Ornithology, the name of an American species of parrotake.

It is of the size of a lark, and in general of a yellow coloured. Its eyes are black, and its beak grey. The edges of its wings are of a dusky green, and its tail long and yellow. It is a very beautiful bird, and very easily tamed. See Psittacus Guarancia.

QUIKNE, in Geography, a town of Norway, in the province of Bergen; 105 miles N. of Christiana.

QUIL, in Zoology. See Quirpele, and Vivera Mungo.

QUILAQUIIL, in Ornithology, the name given by the people of the Philippine islands to a very beautiful species of parrots, which is commonly found wild in the woods there. It is all over of a fine green colour, and is smaller than the common parrots, and has a broad black bill, and black legs. It is a very wild bird, and will not learn any thing.

QUILATE, in Spanish and Portuguese Coinage, a term used for carat; which is.

QUILEA, in Geography, a sea-port town of Peru, near the Pacific ocean, which gives name to a fertile valley, in the jurisdiction of Arequipa. S. lat. 16° 45'.

QUILICI,
QUILLICI, Gaetano, in Biography, an Italian opera- 
finger, with a bafe voice: a good musician, who arrived 
here in 1759, during the performance and opera regency of 
the Mattei. He continued to perform on our lyric stage 
near thirty years, and is, we believe, still living in London, 
we fear, in penury and obscurity. Since quitting the 
stage, he has supported himself, a bed ridden wife, and an ideot 
son, by teaching to sing, and has made some admirable 
performances.

QUILLIMANCY, in Geography, a river of Africa, 
which runs into the Indian sea. 20 miles S. of Melinda. S. 
lat. 3° 16'. E. long. 40° 16'.—Also, a sea-port town of 
Africa, in the kingdom of Melinda, at the mouth of the 
before-mentioned river, belonging to the Portuguese. S. 
lat. 3° 10'.

QUILLAMANE, a town of Africa, in Mozambique. 
S. lat. 18° 15'. E. long. 37° 50'.

QUILLAJA, in Botany, a genus of plants found in 
Chili, and described by Molina. Jull. 444. Lamarck Il-
luibr. t. 774.—Clafs and order, Monoeia Dodecaandra. 
Nat. Ord. uncertain. 

Eff. Ch. Male, Calyx five-cleft. Corolla none. Sta-
mens twelve, or more. 

Female, Calyx five-cleft. Corolla none. Germens five, 
superior, opposite to the segments of the calyx. Styles 
five. Capsules five, carious, of two valves, and one 
cell. Seeds numerous, oblong, inserted into the bottom of 
the capsule, dilated and winged at the summit. 

Such is the character made out by Jullien, from the 
publications of Molina and Frezier, and from specimens of 
the fruit, brought to Europe by Dombey. They belong to a 
tree, whose bark has a foamy quality. The leaves are 
alternate, simple, evergreen. Flowers axillaries.—The gen-
us appears akin to the Magnolie of Jullien; but whatever 
it may be, the name is barbarous and quite inadmissible; 
only tolerable for a time, till some botanist, furnished with 
better materials to define the genus, shall be entitled to give 
it a more classical appellation. Jullien remarks, that another 
plant of Dombey's appears to belong to the above genus. 
This is a tree referred by him to Dioscu Ieofandria, whose 
fruit is called Gayo colorado, and which is the same with the 
"Loque, or Peruvian tree with five capsules," of Jofeph de 
Jullien, whose branches, according to his manuscript ac-
count, are fo long and plant, as to be twitted into 
cors, serving, in the province of Cufco, for the support of 
hanging bridges.

QUILLALA, in Geography, a town of Chili, on the 
Aconcagua: 30 miles E.E. of Valparayso.

QUILLAN, a town of France, in the department of 
the Aude, and chief place of a canton, in the district of 
Limoux: 10 miles S. of Limoux. The place contains 1568, 
and the canton 9195 inhabitants, on a territory of 724 
kilometres, in 22 communes. N. lat. 42° 51'. E. long. 
2° 16'.

QUILLAYACU, a town of Peru, in the diocese of 
Lima: 60 miles E.E. of Guanaco.

QUILLE, a town of Sweden, in Well Gotland: 23 
miles N. of Uddevalla.

QUILLEBEUF, a town of France, in the department 
of the Eure, and chief place of a canton, in the district of 
Pontaudemer, seated on the Seine; eight miles N. of 
Pontaudemer. The place contains 1200, and the canton 
7272 inhabitants, on a territory of 107½ kilometres, in 16 
communes. N. lat. 49° 29'. E. long. 0° 38'.

QUILLET, Claude, in Biography, born at Chinon, 
in Touraine, about the year 1602, was brought up to med-
icine, which he practised some years, till he was obliged to 
quit the country on account of his opposition to a measre of 
Richelieu, which is thus narrated. Quillet was at Loudun 
at the time that Loudernont, a creature of the cardinal, 
was sent thither to take informations respecting the pretend-
ed poiffion of some nuns by the forceries of Urban Gran-
dier (fee his article), an imposture which Richelieu thought 
fit to favour. The counterfeit Satan on one day threatened, 
that on the morrow he would lift up to the roof of the church 
any one who should presume to call his power in question. 
A large company appeared on the next day with M. Loubarde-
mont, when Quillet, who also was present, challenged the 
devil to keep his word. To the surprize of the superlilious 
who had met on the occasion, nothing followed, but the 
changer found to his colt that he had given offence to a 
mightier power than Satan, and felt it necessary to quit 
Loudin in hafle, and retire to Italy. He went to Rome, 
and was engaged as secretary to the French ambassafador at 
that court. He probably returned to France with that mi-
niiter, after the death of Richelieu, and in 1655, he publish-
ed at Leyden, under the name of Calvidius Letue, the 
poem by which he is chiefly known, entitled "Calippedia 
dive de pulchrae Prolis habendae ratione." In the first 
version were some farical lines against Mazarin. The cardin-
als sent for him, and having gently remonstrated with him 
for treating his friends with severity, promised to give him 
the first vacant abbey. Quillet threw himself at the cardinal's 
feet, asked pardon, assured him he would infallibly oblitera-
the offensive lines, and begged, as a sign of his penitence, 
to be allowed to dedicate the poem to him. This was done 
in the Paris edition of 1656, and Quillet became the flatterer 
of him who had been the object of his satire. He 
died at Paris in 1661, repeating not of his abdution, but 
of the licentious calf of some of his verses. The 
Calippedia has gone through many editions, and has been tr
lated into various languages. "It is," says an able critic, "an 
genious performance, agreeably varied by fable and episode, 
but frivolous in its main topic, and in its reasonnings. Its 
details are frequently loose and inflammatory, and that a car-
dinal should have allowed it to have been dedicated to him, is 
a proof bow little regard was paid, at that period, to the 
rules of decorum. The verification, though generally free 
and flowing, is by no means correct, and the diction is 
frequently impure." Quillet composd a version of Juvenal 
in French verse, and a Latin poem in twelve books, entitled 
"Henriados," or the actions of Henry IV. This, with 
other papers, he left to Menage, with 500 crowns to defray 
the charge of printing them, but the abbe took the money, 
and neglected the conditions.

QUILLIGA, in Geography, a country of Africa, in 
Upper Guinea, near the river Maqualbary.

QUILLOBO, in Botany, a name given by some to a 
species of ketmia, called ali quingombo.

QUILLOT, Killoo, or Killo, in Commerce, a Turkish 
corn measurer, weighing, in wheat, about 23 oke, or 60lbs. 
avoidoops: 4 kilos make 1 fortin; ¾ kilos answer 
nearly to 1 English quarter. A killo of rice contains 10 
okes, and the oke is 400 drachmas.

QUILLOTA, in Geography, a town and jurisdiction of 
Chili. The town does not contain above 100 families, but 
those scattered over the country exceed 1000.

QUILL, a town of France, in the department of the 
Loire Loire; 7 miles N. of Savanay.

QUILOA, a country and kingdom of Africa, situated 
near the east coast, near the mouth of the Coavo, about 
180 miles from north to south; but the extent inland towards 
the west is unknown. This country was first discovered by 
the Portuguese, in the year 1498. The king and his sub-
jects
jects are Mahometans; the latter partly black and partly tawny. They all speak the Arabic and several other languages, which they learn from the nations they traffic with. Their dress is that of the Arabian Turke: the women especially affect finery, with variety of ornaments about their necks, arms, wrists, and ankles; particularly bracelets made of ivory, curiously wrought; which upon the death of a parent, husband, or near relation, they break in pieces, in token of sorrow, whilst the men express theirs by shaving their hair, and abstaining from food. The capital of the kingdom is situated on an island near the mouth of the Convo, and is laid to be large, rich, and well built. The houses are of stone and mortar, handsome, and after the Spanish manner. They are several stories high, and have each a pleasant garden behind, well watered and cultivated, here being plenty of springs of fresh water. The houses are finely furnished within, and terraces on the top, with a kind of hard clay, and the streets so narrow, that one may easily step from one side to the other. On one side of the town is the citadel, where resides the Mahometan prince. It is adorned with flatly towers, and surrounded with a ditch and other fortifications. It hath two gates, one towards the port, whence one may see the ships falling in and out; the other looking towards the land. The country about Quilao, though low, is yet very pleasant and fertile in rice and millet, fruits and good pasture; so that they breed abundance of cattle, besides poultry of all sorts, both wild and tame. They have fift likewise in great plenty, and very good. The climate is likewise affirmed by moit travellers to be very temperate and healthy; Sanut being the only author we know of who hath ventured to assert the contrary in all these respects. S. lat. 8° 35'.

QUILONNE, a province of Africa, in the kingdom of Sabia.

QUIOLOA, a small island in the Indian sea, near the coast of Africa. S. lat. 13°.

QUILTAiNEN, a town of Prussia, in the province of Oberland; 8 miles S.E. of Holland.

Quiltaon, one of the Laccadive islands, in the Indian sea. N. lat. 12°. W. long. 72° 45'.

Quilling denotes the operation of weaving a fort of coat or texture, formed of the strands of rope, about the outside of any vessel, to contain water, &c. as a jar, cask, bottle, &c.

Quimichpatlan, in Zoology. See Sciuens Vo|bacela.

Quiminatin, in Geography, a small island in the sea of Mindoro. N. lat. 10° 55'. E. long. 120° 40'.

Quimiri, a town of Peru, in the diocese of Lima; 40 miles N.E. of Naca.

Quimo, a small island on the east side of the gulf of Bothnia. N. lat. 63° 17'. E. long. 21° 52'.

Quimper, a city of France, capital of the department of Finistère, and chief place of a district, seated on the Oder; before the revolution the see of a bishop, the seat of a governor, an admiral, &c. The place contains 66,088, the canton 17,028 inhabitants, on a territory of 90 kilometres, in seven communes. N. lat. 47° 50'. W. long. 4° 16'.

Quimperle, a town of France, and chief place of a district, in the department of the Finistère. The place contains 41,672, and the canton 91,278 inhabitants, on a territory of 125 kilometres, in 15 communes.

Quin, Dr., of Dublin, in Biography, an eminent physician, and one of the most enlightened dilettante musicians with whom we have ever been acquainted. This gentleman, who, during his travels, resided in Italy some years, had heard and studied music with such taste and intelligence, that his opinions and conversations on the subject were equally entertaining and instructive. He resided in Dublin at the time of Handel's arrival in that city, 1742; and perfectly remembering his performance, person, and manners, in 1788 wrote us word, that he (Handel) was received in Ireland by persons of the first distinction with all possible marks of esteem, as a man, and admiration as a performer and composer of the highest order. And adds, 'the Messiah, I am thoroughly convinced, was performed in Dublin for the first time, and with the greatest applause. Mrs. Cibber and Signora Avolio were the principal performers. These, with the assistance of the choristers of St. Patrick's cathedral and Christ-church, formed the vocal band; and Dubourg, with several good instrumental performers, composed a very respectable orchestra. There were many noble families here, with whom Mr. Handel lived in the utmost degree of friendship and familiarity. Mrs. Vernon, a German lady, who came over with king George I. was particularly intimate with him, and at her house I had the pleasure of seeing and conversing with Mr. Handel; who, with his other excellencies, was pelless to a great lock of fortune; no man ever told a story with more. But it was requisite for the hearer to have a competent knowledge of at least four languages: English, French, Italian and German; for in his narratives he made use of them all.'

Quin, James, was born in London in 1693. He was the son of an Irish gentleman, and received his education in the capital of that country. His father had, ignorantly, married a woman supposed to be a widow; whole husband, after a long abstinence, returned and claimed her. The subject of this article was the offspring of this connection, and was accordingly illegitimate, and upon his father's death, in 1716, was left almost destitute. For want of education he was, at the age of twenty-one, without a profession, and was under the necessity of appearing on the stage at Dublin, in the very lowest characters. He displayed, however, rising talents, which induced a friend to advise him to attempt some better parts in London, and he was accordingly admitted into Drury-lane company in 1715. After the experience of a year or two, he entered himself under Rich at Lincoln's-Inn theatre, where he continued to perform during seventeen years. He was allowed, by the most competent judges, to shine both in tragedy and comedy. His utterance was weighty and impressive, which, however, was accompanied with various defects. He was, from cauuses not well ascertained, continually changing from one theatre to another, and perhaps he may be ranked among that number with whom it was difficult to keep terms. His passions were strong, his temper irritable, and his language often coarse. He was of convivial habits, and, it has been said, grossly attached to the pleasures of the table. There was, however, a fund of generosity in his temper, which shewed itself in many sentiments, and, occasionally, in benevolent actions. The circumstance of his giving a 1000l. to the poet Thomson, when he was under an arrest for debt, has often been told to his honour. It was the commencement of a strong friendship between them. After Thomson's death, he appeared in that poet's tragedy of Coriolanus, and spoke a prologue, written on the occasion by lord Lyttleton, with a pathos that did honour to his feelings. His last performance was the favourite part of Fallstaff, for the benefit of his friend Ryan in 1753. He now retired to Bath, where his fund of anecdote, and strong pointed sense, rendered his company much sought after. He had good breeding, which fitted him for the highest societies, when he chose to act the gentleman; and his frankness and candour were frequently
frequently put up with for the sake of his companionable qualities. Quin died at Bath in 1766, at the age of seventy-three. Garrick, whose superior talents are suppos'd to have driven him from the stage, but afterwards his steady friend, wrote a poetical epitaph for his monument. While Quin continued on the stage, he constantly kept company with the most celebrated geniuses of the age. He was on intimate terms with Pope and Swift; and was frequently invited by the earl of Chesterfield to his table. His peculiar judgment in the English language recommended him to his royal highness, Frederic prince of Wales, who appointed him to instruct his children in speaking and reading with graceful propriety. When Quin was informed of the elegant manner in which his present majesty had delivered his first gracious speech from the throne, he was in raptures, and the king soon after gave orders, without any application on the part of Quin or his friends, that a genteel pension should be paid him during his life.

Quin, in Geography, a village of the county of Clare, Ireland, where are the remains of a monastery, which was founded for Franciscan friars in 1402, and repaired by the Roman Catholics in 1604. Bishop Pocock speaks of it as one of the finest and most entire monasteries he saw in Ireland. It is situated on a fine stream, with an ascent of several steps to the church; at the entrance one is surpris'd with the view of the high altar, entire, and of an altar on each side of the arch of the chancel. The building is quadrangular, with piazzas supported by a number of pillars; there are apartments on three sides of the cloisters, with a vaulted room under them all. A round tower and some other ruins are adjoining. Quin is 15 miles from Limerick, on the road to Galway, and about 106 miles W.S.W. from Dublin. Archdall's Monasticon. Carlisle.

Quina-Quina, in Botany. See Leaf.

Quinabaug, in Geography, a river of America, formerly called "Mobegan," which rises in Brimfield, Massachusetts, and is joined at Oxford by French river, which has its source in Sutton, Worcester county. It runs a southerly course, and discharges itself into Shetucket, about three miles above Norwich Landing, in Connecticut. In the first part of its course it furnishes many good mill-sites: as it advances, the intervals in many places are wide, and afford a most excellent foil.

Quina-Quina, in Botany, a Peruvian name, generally applied to the Peruviann bark. (See Cinchona.) Jussieu, however, in his Gen. Pl. 336, informs us, that it properly belongs to a tree, nearly if not entirely agreeable in genus with Myropermum of Jaccquin, or Myroxylon of Linnaeus. (See the last-named article.) An account of the Quina-quina may be found in the Memoires de l'Acad. des Sciences for 1738, p. 237.

Quinaria, so called by Loureiro, Fl. Cochinch. v. 1. 272, from the prevalence of the number five in the parts of fructification, is the Wampfo or Wampi of the Chineef, now established as a genus by the name of Cookia. (See that article.) This plant passed long, in the gardens of England, for Gaura trieblioides, according to the observation of the late Mr. Dryander.

Quinarius, Quinary, in Antiquity, a little Roman coin, equal to half the denarius. See Coin.

The quinarius was properly the Roman halfpenny.

Medalists indeed use the term quinarius in the general for a medal of any matter, not exceeding the size of our six-pence; but F. Chamillart, in an express dissertation, shews this to be an abuse. The silver coins, current under the republic, he shews, were two: the one weighing a drachm, and called denarius, as containing ten as; the other weighing half a drachm, and called quinarius, as containing five as; which coins continued on the same footing under the emperors.

Hence the origin of the word quinarius: and hence, in propriety, it is only the silver medal of the weight of half a drachm that the name belongs to; the Romans having never given it to any other species of the same size with it. It is only by way of analogy, therefore, that the moderns apply it to the medals of gold, or copper, of the same size with the silver quinarius; those of gold being fixed at a value much above, and those of brass much below five a.

The only relation between these quinarii is, that the gold quinary is the half of a gold medal, as to weight and value; and the brass quinary half a brass medal, as the silver quin

Hence a feries of quinarii should seem at least a necessary in the cabinets of the curious, as the feries of great medals; they being all equally different species of money, which teach us how many kinds of pieces there were of any metal current in commerce.

Add to this, says our author, that the quinarii were of a finer and more finished coin than the other medals, being wrought by the hands of the maffers; which seems owing to the nicety required in engraving whole figures in fo small a compass. He adds, that though quinarii are very scarce, yet M. the duke of Maine had almost a complete set of them.

Quinaul't, Philip, in Biography, a French poet, was born in 1560, probably in a low condition; though while some may he the son of a baker, others maintain that he was descended from a family of consequence at Paris. He had, however, very few advantages of education, but was soon found to possess a talent for poetry and the belles lettres. Before the age of twenty he brought out some pieces on the stage; and for a number of years, he continued to produce dramatic works of different kinds, which were much applauded by the public voice; but some of which drew upon the author the satires of Boileau, who carried the matter so far as to injure his own reputation. Quinaul't now associated himself with Lulli in the composition of operas, and displayed an excellence in lyric poetry, or that adapted to music, which placed him beyond competition in that branch, and has ranked him among the distinguished characters of the age of Lewis XIV. Nothing, it is allowed, can be more tender, delicate, and ingenious, than the turn of his fongs and love-dialogues; and no one has more happily accommodated the melody of French verse to musical expression. His "Armida" and his "Atthys" are spoken of as master-pieces of their kind. Notwithstanding the high reputation which he enjoyed as a poet, he applied himself to the study of the law, and eventually made his fortune by marrying the rich widow of a merchant, to whom he had been useful in his profession. After this, he purchased the place of an auditor in the chamber of accounts. He was received into the French academy, and, in the name of that society, harangued the king on his return from the campaigns of 1675 and 1677. He died in 1688, having enjoyed a pension from Lewis XIV. several years previously to his decease. In his last illness he was extremely penitent, on account of his having devoted his talents too frequently to the excitement of the licentious passions. He left a family of five daughters, and was esteemed in society attentive, polite, and mild. Besides his numerous pieces for the stage, he wrote occasional poems. His works were printed at Paris in 5 vols. 12mo., 1739, and again in 1778.
It has been said that Quinault’s apprenticeship to poetry was served under Trifian l’Hermite, by being his domestic. The lessons of Trifian were probably of some use to him, as that author had had long experience in theatrical matters; but Quinault owed still more to nature; as before he was twenty years old, he had distinguished himself by several pieces for the stage, which had considerable success; and before he was thirty, he produced sixteen dramas, some of which were well received by the pit; but not all equally. It is supposed that some of these early pieces prejudiced Boileau against Quinault early in his career. There was neither regularity in the plan, nor force in the style: romantic lovers and commonplace gallantry, in scenes which required a nervous pencil and vigorous colouring. These were defects not likely to escape the laf of the French Juvenile. He covered the young poet with ridicule; reproached him with the affectedly soft and languishing dialogue of his lovers, by whom even I hate you was said tenderly.

Quinault, born with great sensibleness, was so wounded by his severity, that he applied to the magistrates, not only to silence Boileau, but oblige him to remove his name from his fates; but the attempt was vain. His enemy insulted him still more cruelly by an epigram on the subject.

"—Peace! peace! my friend—
If from the public thou’ld avoid disgrace,
From thy own works, not mine, thy name efface."

It was not till after Quinault was inlifed by Lulli to write for the opera, that he silenced all his enemies, except Boileau and his party, who envied him his successes. The French nation knew no better music than that of Lulli, and thought it divine. Quinault’s was thought of secondary merit, till after his decease; and then, in proportion as the glory of Lulli faded, that of Quinault increas’d. Voltaire, in the first edition of his „Siecle de Louis Quatorze,” in 1749, seems to have been the first who spoke out on the subject; not forry, perhaps, to lower Boileau a little in the eyes of the public. He there says, that “Quinault was celebrated for his beautiful lyric poetry, and for the gentleness with which he opposed the unjust fates of Boileau. His poetry was greatly superior to the muse of Lulli. It will always be read; and Lulli, except in a few of his recitatives, can no longer be supported. However, it was long believed that Quinault entirely owed his fame to Lulli. Time appreciates all things.”

After this, his writings began to be examined and felt; and of late years, his name is never mentioned by his countrymen without eloge. His operas, though admirable to read, are ill calculated for modern music; and are obliged to be now written, ere they can be new set, even in France. Marmontel, who had modernized several of them for Piccini to set in 1788, gave M. Laborde a differtation on the dramatic writings of Quinault for music; which is published in the fourth volume of his „Effais sur la Musique.”

He begins by allering that Quinault was the creator of the French opera upon the most beautiful idea that could be conceived: an idea which he had realized with a superiority of talent, which no writer has since approached. His design was to form an exhibition, composed of the prodigies of all the arts; to unite on the same stage all that can interest the mind, the imagination, and the senses. And this illusive theatre Voltaire has admirably descrived:

"Il faut se rendre à palais magique,” &c.

"Haste to the magic palace, where abound
The joys sublime of verse, of dance, and sound;

Where bright illusion facinates the sight,
And firen-notes the enchanted ear delight;
Where all the plactic powers of art are shewn,
And joys unnumber’d are combind in one.”

For this purpose a species of tragedy is necessary, that shall be sufficiently touching to move, but not so audble as to refute the enchantments of the arts that are necessary to embellish it. Historical tragedy, in its majesty and gloomy simplicity, cannot be sung with any degree of probability, nor mixed with festival and dances, or be rendered susceptible of that variety, magnificence, show, and decoration, where the painter and the machinist ought to exhibit their enchantments.

In Italy, where genuine tragedy has no theatre appropriated to its use, a people passionate for music have permitted Regulus, Themistocles, Alexander, and even Cato himself, to utter their speeches in song; but a people, whose taste ought to be more ferre, and more delicate, as to probability, having for comparison the school of Corneille and Racine, would have been very unwilling to substitute the recitative of Lulli to the declamation of Baron. Melody itself is a fabulous and magical language; and in a theatre where all is prodigy, it seems consistent that the manner of speaking should be that of enchantment as well as the rest. We are then in a new world: it is nature beautified, and vividly animated by a crowd of intelligences, whose wills are laws. Music there plays a marvellous part; music there constitutes the probability of the marvellous; but in a representation where all palies for nature, according to truth and history, by what means can we be prepared to hear Augustus, Cornelia, Agrippina, or Brutus singing? Might it not be replied, “By the same means as the French are reconciled to these fame exalted characters conversing in rhyme.” When once it is settled that all the characters converse in a musical language, no other is expected, and the audience is soon reconciled to it. But all this is to prove that the French alone are right, and Italy and all the rest of the world wrong as to the musical drama. The rest of Europe is tired and ashamed of flying gods and goddeses, and have long since surrendered mythological wonders both in poetry and music to their children. But all people are thought barbarians, who do not implicitly adopt the tall and fashions of France.

But to return to Quinault, whom all the wits of the time tried to write down. Ignorant of music and its powers, they thought Lulli always right, and the poor, modest, unpretending Quinault always wrong. P롤erity has long discovered the converse of this supposition to be the truth. Quinault’s great mistake and misfortune, says La Harpe, was the calling his pieces tragedies, and not operas. He would not then have been regarded as a rival of Racine, or have offended classical hearers or readers with the little resemblance these compositions had to Greek and Roman dramas, or to the genuine tragedies of the moderns.

QUINCE Tree, in Gardening, the common name of a tree of the apple kind. See Pyrus Cydonia.

QUINCE, in the Materia Medica. The fruit of the quince is alluring and aromatic; and its expressed juice, in small quantities, as a spoonful or two, is of considerable service in nausea, vomitings, madorous eructations, and some kinds of alvine fluxes. This juice was formerly ordered in the Lond. Pharm. to be made into a fyrup, called “fyrupus cydoniarum,” or fyrup of quinces, prepared by digestion three pints of the deputred juice with a drachm of cinnamon, half a drachm of ginger, and half a drachm of cloves, on warm ashes,
QUINCHAC, a small island in the Pacific ocean, between the island of Chloé and the continent of Chili. S. lat. 43° 36'.


Gen. Ch. Cal. Perianth superior, of one leaf, in four deep, ovate, unequal segments, one larger than the rest. Cor. of one petal; tube funnel-shaped, much longer than the calyx, quadrangular, curved; limb in five lanceolate, acute, spreading segments. Stam. Filaments five, very short, inserted into the top of the tube; anthers oblong, the length of the limb. Fil. Germen roundish; style thread-shaped, the length of the tube; stigma capitate. Peric. Berry (rather drupa) roundish. Seed solitary.


1. Q. chilensis. Willd. n. 1. (Quinchantamali hiis folio; Feuill. Plantes Médicinales, 57. t. 44.)—Gathered by Feuillé on the mountains of Chili, and by Dombey, among stones on the hills about Lima, flowering in December and January. The root is annual, composed of a few simple yellow fibres. Stem several, prostrate, simple, round, leafy, from four to six inches long. Leaves scattered, linear, linear, entire, fleshy, smooth, bluntish with a small point. Flowers in simple, terminal, solitary, dense spikes. Corolla green externally, of a saffron yellow within. Seed round, uncon

Something of this mode of arrangement has always a good effect in the disposition of shrubby plants, &c. though not in the regular order of it, but something nearly so, which gives the shrubs a greater scope of growth, and shews them to greater advantage. It is likewise a mode of planting that is proper in the kitchen-garden, in transplanting many kinds of eucalyptus trees; such as lettuces, endive, strawberries, and even all the cabbage kinds, and many other plants, which gives them a greater scope to grow than if planted exactly square at the same distance from each other.

It is of this kind of quincunx that Cicero speaks, in his Cato Major; and Quintilian, lib. viii. cap. 3.

The modern quincunces, Daviller observes, are made like those of the ancients, except for the fifth tree, which is now generally diffused; so that, being as it were netted, and their avenues viewed by the side of the rectangle, they formed a perfect chequer.

QUINCE, in Astronomy, &c. denotes a position, or aspect of the planets when distant from each other a hundred and fifty degrees, or five signs.

QUINCY, in Geography, a town of France, in the department of the Seine and Marne; six miles S.W. of Meaux.

Quincy, a port-town of America, in Norfolk county, Massachusets, taken from Braintree; 10 miles S. of Boston. It contains 1281 inhabitants, most of whom are farmers; but large quantities of shoes and boots are manufactured for exportation. The town has an episcopal and congregational church.

QUINDECAGON, in Geometry, a plain figure which has fifteen sides and fifteen angles.

The word is formed somewhat irregularly, from the Latin quinque, five, and the Greek πέντε, and γωνία, angle. Pentadecagon would be a more regular term.

If the sides be all equal, it is a regular quincunx.

Euclid shews how to inscribe it in a circle, Prop. xvi. lib. 4. And the side of a regular quincunx so described, is equal in power to the half-difference between the side of the equilateral triangle, and side of the pentagon; and also to the difference of the perpendiculars let fall on both sides, taken together.

QUINDECIM VIR, XV. VIR. a Roman magistrate, who
who had fourteen colleagues joined with him in the same function.

Under Tarquin the Proud, there were first two magistrates erected to take care of the sacrifices to be performed; these were called duumviri. Their number, at length, grew to ten, and then they were called decemviri. In the time of Cicero it had reached to fifteen, when they assumed the name of quindecimviri; and though their number grew to forty afterward, yet Servius oberves, on the sixteenth of the Æneid, that their name never after changed, but they still continued to be called quindecimviri.

They were the persons who examined the Sibyls' books, and were the interpreters of them; yet they never did this but by public order of the senate, declared by a senatus consultum. They also presided at the sacrifices, and all other extraordinary ceremonies of religion.

On medals, a dolphin joined with a tripod marks the priesthood of the quindecimviri; who, to publish their solemn sacrifices, used on the eve of them to carry a dolphin at the end of a pole throughout the city; that fish being esteemed sacred to Apollo, as the crow was among birds.

QUIPAUGE, or East River, in Geography, a river of America, in Connecticut, which runs a southerly course into the N.E. corner of New Haven harbour.

QUINEY, a town of France, in the department of the Doubs, and chief place of a canton, in the diocèse of Besançon; nine miles S.W. of Besançon. The place contains 1,079, and the canton 11,734 inhabitants, on a territory of 372\(\frac{3}{4}\) square kilometres, in 36 communes. N. lat. 46° 0'. E. long. 5° 57'.

QUINGOMBO, in Botany, the name given by the people of Congo to a species of ketmia, distinguished by M. Tournefort by the name of the ketmia Brunfeli's folio focus, fruictu pyramidato fulcato, the fig-leaved Brazilian ketmia, with a pyramidal fulcated fruit.

QUINISDAI, in Geography, a town of Norway, in the province of Christianfand; 35 miles W.N.W. of Christianfand.

QUINSEXTUM, in Ecclesiastical History, denotes a council held at Constantinople in the year 692; called also the council in Trullo, and by the Greeks Pentébê, q. d. fivesith; as intimating that it was only a supplement of the two preceding councils. Though, in propriety, Fleury oberves, it was a council itself.

Marshall observes, that the fifth and sixth general councils having made no canons relating to the external celebration of divine worship, the government of the church, and the lives and manners of Christians, the Orientals judged it necessary to supply that defect by this; so that the 102 canons falsely attributed to these, were in reality made here. See Trulum.

QNINET, in Mining, the name of a tool used in the cleaving rocks by means of gunpowder. This is a sort of wedge fitted to the flat side of what is called the gun; that is, a cylindric piece of iron, only flattened in one part to receive this, and drilled through. When a proper hole has been made in the rock by the borer, the powder is put in, and then the orifice being fitted by the gun, and that wedged in by this quinnet, the powder being fired by a train communicating with the hole drilled through the gun, exerts all its force on the rock, and splits it in several directions at one explosion. Phil. Trans. No 167.

QUINOAL, in Geography, a town of Mexico, in the province of Culiaca; 50 miles S.E. of Culiaca.

QUINQUAGENARIUS, among the Romans, was an officer in the army, who had the command of a company of fifty men.

Quinquagenarius was also an officer of policy, who had the inspection of fifty houses, or families.

And in the ancient monasteries, quinquagenarius was a superior who had fifty monks under his guidance.

QUINQUAGESIMA-SUNDAY, Shrove-Sunday. It is thus called, as being about the fiftieth day before Easter. Anciently they used quinquagesima for Whitunday, and for the fifty days between Easter and Whitunday; but to distinguish this quinquagesima from that before Easter, it was called the Paschal Quinquagesima.

QUINQUANGULAR LEAF. See LEAF.

QUINQUANNION, QUINQUENNALTA, in the French Cycles, a respite of five years, which insolvent debtors formerly obtained by virtue of the king's letters, to have time for the payment of their debts.

When the thing intended was only to prevent the sale of their effects at an under-value, the term of one year was ordinarily granted, and this was called the benefit of anion.

But when the debtor would avoid the surrendering of his effects, upon proving that he was reduced by poverty, looses, &c. to make use of this expedient, the term of five years was granted, and called the benefit of quinquanion.

QUINQUATRIA, in Antiquity, a name given to the feasts of Minerva, otherwise called Panathenea.

Some think they were termed quinquatria, because they lasted five days; but others, with more reason, think it was because they fell out five days after the ides of the month.

QUINQUE PORTUS, the five cinque ports.

"Servitum quod barones quinque portuum praescriptum recognoverint facere ad fundationem regis per annum, ni contigerit per 15 dies ad cultum eorum proprium; ita quod primius dies computatur a die quo vel a navium excre- runt, usque partes ad quas tendere debent, vel uterius, quamdiu rex voluerit ad cultum ejus." Thorn.

QUINQUEFOLIUM, in Botany, Cinquefoil, the old name of the Linnean genus Potentilla, many, but by no means a majority, of whose species have five leaves on a stalk. Gmitter, who, like many others, was discontented with Potentilla, substituted the word Pentaphyllum. See POTENTILLA.

QUINQUEMPOIX, in Geography, a town of France, in the department of the Lower Seine; seven miles N. of Rouen.

QUINQUENNALIA, in Antiquity, games, or feasts founded at Tyre, celebrated every five years, in honour of the deified emperors.

The quinquennalia began to be expressed on medals about the middle of the third century. F. Pagi produces a medal whereon are engraven those of the emperor Posthumus; they are not found on any medals of his predecessors.

QUINQUENNALS, a magistracy in the colonies, and municipal cities of the Roman commonwealth; much the same with tible at Rome.

They were not thus called from their continuing in their office five years; but because they were elected every fifth year, to reside at the cenus, and to receive the declaration each citizen made of his effects.

QUINQUENNES, in some old Historians, a name given to a certain people of India, among whom the women began to bear children at five years old, and seldom lived to more than eight years. Pliny gives us this account; and Solinus, who repeats it from him, increases the miracle by telling us, that...
that they were a nation of women who had no men among
them.

**QUINQUEPARTITE LEAF, among Botanists. See Leaf.**

**QUINQUEPRIMI, among the Romans, the five principal
men in the Senate of every municipal town.**

**QUINQUERMIS, in the Naval Architecture of the
Ancients, a name given to a galley which had five rows of
oars. They divided their oars in general into monocrora
and polycrota; the former had only one tier of rowers;
the latter had several tiers of them, from two or three,
up to twenty, thirty, or even forty; for such a vessel
we have an account of in the time of Philopater, which
required no less than four thousand men to row it. See
POLYCROTA.**

**QUINQUETIONES, among the Romans, an appellation
given to those who had gained the victory in the quinquemiviris,
or pentathlon.**

**QUINQUERTIUM** was the name of the same Grecian
pentathlon, comprehending the five exercises of running,
leaping, throwing, darting, and wrestling. See PENTATHLON.

**QUINQUE VIR, frequently wrote V. VIR, a Roman
magistrate, who had four colleagues joined with him in the
same function.**

There were various kinds of officers thus denominated.
Pomponius the lawyer mentions quinqueviri on this and on
that side of the Tiber, established for the administration of
justice in the night-time, in lieu of the ordinary magistrates,
who were not judged proper to run up and down the streets
in the dark.

Rofinus tells us, that they were sometimes the quinquemiviri
who conducted the colonies, and divided the lands assigned
to them among the several families.

Sometimes the epulones were five in number; in which
case they were called quinqueviri. See EPULO.

**QUINQUEVIRI MONETAII, were officers first erected
under the influence of Valentius Poplicola, to moderate the
excessive usury, or interest, which creditors or bankers used
to exact from the people.**

**QUINQUINA. See Cortex Peruvianus.**

**QUINASY, sometimes written Quinansey, and Quinya,
in Medicine, a corruption of the French word quinquains,
which again is derived from the Greek, cinanthe, cinaxynyn,
signifying fore-throat, or inflammation and tumour of the internal
fauces. The term is applied generally to inflammations of the throat,
but more particularly to the acute inflammation of the tonsils.
A tonsil, enlarged from inflammation, is also emphatically
called a quinya. See CINANCHE TONSIILARIS.**

**Quinya,** among domestic animals of the live-stock fort,
is an affection about the throat and breast, which often
attacks them, and which is very obstinate and troublesome.
In horses it is usually called anticor. See FIFTHS.

**QUINSIEME, or Quinzieme, in our old Law Books. See FIFTHS.**

**QUINSIGAMOND, or Long Pond, in Geography, a
lake of Massachusets, between Worcester and Shrewbury.
This is a beautiful lake, in form of a crescent, about five
miles long, and from 30 to 100 rods broad. It is intersected
with a number of islets, one of which is upwards of 200
acres in extent.**

**QUINSON, a town of France, in the department of the
Lower Alps; 25 miles S.S.W. of Digne.**

**QUINT, a sequence of five cards of the same colour.
Seem SEQUENCE.**

**QUINT, Ital. QUINT, Fr. (See FIFTH and DIA-
FENTE.) The chord of the 5 in thorough-bass is resolved
two ways: first, by the base rising one note, and the lowest
trebble note descending; secondly, by the highest note of
the chord rising, and the lowest remaining stationary, when
the discord is resolved upwards. This is what Rameau calls
le double emploi de la dissonance.**

**QUINTA Pars, in old madrigals, a 5th vocal part, com-
pared of the refule of the other four.**

**QUINTA Effentia, See Quintessence.**

**QUINTAIN, Quintana, in Ancient Customs, a post,
or pillar, driven into the ground, with a buckler fixed to it,
for the performance of military exercises on horseback,
the throwing of darts, breaking of lances, &c.**

Mathis, Paris describes the quintain as a kind of mark,
formed like a man from the waist upwards, holding a shield
in his left hand, and in his right a sword or flieck; the
whole is fitted as to turn round on its foot, and has a
sharpened running blade against it with a lance, if he hit it in
the breast, it wilted round, and, unless he were very dexterous,
struck him with the sword held in the other hand.

In other places, at the top of a pole, was erected a slender
beam fitted to turn round a spindle; at one of whose ends
was a slop or flat board, and at the other a bag of sand or
dirt. The sportal was, with a long staff, or wooden lance,
to ride a-tilt at the board, and to be either so skilful or lucky
to escape the blow of the sand-bag.

This same take to be the fame with the arculum levatio,
frequently prohibited in our old fynods and episcopal
constitutions.

The custom is still retained in Shropshire, and some other
counties, among the nuptial solemnities. He that breaks
the most poles against the quintain, has the prize; which
was anciently a peacock, but is now a garland.

Some derive the word from an ancient game called quintus;
others from a man of the name of Quintus.

The vallus and palus, mentioned in Cæsar, are taken by
Vignere, for a kind of quintain, or wooden man, fixed up
as an adversary, or man of straw, to prove one's dexterity
against.

Mention is made of this exercise in the Code, De Ale-
toribus, and in the Parrotilles of Cujas on the same. Juvenal
speaks of women engaging in it:

"Aut quis non vidit vulnera pal? &c.?"

**QUINTAIN was also a right which the lord had to oblige
all the millers, watermen, and other young people unmarried,
to come before his castle every three years, and break several
lances or poles against a post, or wooden man, for his
diversion.**

**QUINTAL, in Commerce, the weight of a hundred
pounds.**

The quintal admits of some difference in different places,
according as the pound consists of more or fewer ounces,
and as the ounce is lighter or heavier.

Thus, a quintal the Parisian quintal, or pound, in the old
sylemen, yields 123 lbs. at Montpelier; and the Montpelier
hundred only 81 lbs. 9 oz. 18 gr. French poids de marc, or
88 lbs. avoirdupois nearly. The quintal of Contantinople is
equivalent to the weight of all those used in the Levant;
it contains 44 oke, or 100 rotolli; the oke being 4 yu-
dromes or chequees, or 400 drachmas, and the rotolli 176
drachmas. The quintal, or kintal, of cotton yarn is 45 oke.
The quintal, or cantaro, weighs about 123 lbs. avoirdupois,
and the oke 2 lbs. 13 oz.; the rotolli, 196 oz. and the che-
quee, 14 oz. avoirdupois. The quintal is equal to 112 lbs.
Amsterdam; 124 lbs. of Venice; and 160 of Leghorn.
The quintal of Lignons contains 4 arrobas, the arroba
32 pounds, the pound, libra, or arrate, 2 marks, or 16 ounces;
the ounce, 8 outavas; 13½ quintals make a ton. The

8 pound
A pound of Lisbon weighs 9552 Dutch ales, 70844 grains English Troy weight; and therefore 83 lbs. of Lisbon = 87 lbs. avoirdupois weight.

The English quintal usually consists of 112 lbs. avoirdupois, and is divided into four quarters.

**Quintal** was also formerly used for a weight of lead, iron, or other common metal, usually equal to a hundred pounds, at six feet to the hundred.

**Quinte, Ille de, in Geography,** an isle in lake Ontario, Upper Canada, which lies close off the shore of Ameliaburg, and opposite the W. point that forms Sandy bay.

**Quinte,** in French music, is the name of the instrumental tenor part in full pieces, usually written in the mezzo soprano clef on the second line. All the instrumental tenor or alto viola parts, in Purcell's time, were written in this clef, as may be seen in his overtures and act-tunes. This was an imitation of France, where all the tenor parts in Lulli and Rameau's operas are in the mezzo soprano clef.

**Quintello,** Ital. Quinque, Fr. a vocal or instrumental composition in five parts, allargado, and generally a pertu equale. The instrumental quintets of Boccherini and Mozart are sublime productions: there is, perhaps, no instrumental music in which more genius and abilities are manifest, than in the quintets of these great masters.

**Quintenar,** Et. in Geography, a town of Spain, in New Castile; 37 miles S. of Huetta.

**Quinter, Quintoiqer,** Fr. in the first attempts at harmony, was counterpoint in a series of 5ths, any two of which, in aftertimes, would ruin for ever the reputation of a composer.

**Quintessence, quinta effentia,** in the old Chemistry, properly denoted the fifth essence, or the result of five successively distilled fractions. The term, now obsolete, was used to express the highest degree of rectification to which any substance could be brought. It also signified a preparation consisting of the essential oil of some vegetable substance, mixed and incorporated with spirit of wine.

Thus, on a proper quantity, e. gr. of essential oil of fenoff, pouring twelve times the quantity of pure alcohol prepared per 6, they instantly unite into one similar liquor, which is the quintessence of that plant.

The ancients were perfectly acquainted with the method of dissolving oil in spirit of wine; and even some of the moderns have questioned its reality; but the certainty of the thing is easily proved, from the instance above, and from a thousand others.

If such quintessence be several times digested, cohabated, &c., the oil will at length be broken so fine, as, like the spirit itself, perfectly to mix with water; which is one of the most extraordinary effects in all chemistry.

After the like manner is made a quintessence of camphor, by only pouring on it spirit of wine.

Quintessences, thus prepared, were supposed to have great medicinal virtues; on account of the pure and potent ingredients used in their composition; which retain, in a great degree, all the virtues of the plants they are procured from; and hence their denomination.

Boerhaave thinks, they might properly be called vegetable sulphurs made potable, and raised to their utmost degree of power and efficacy.

Dry quintessences may be made from the liquid ones, by adding to them some more essential oil of the same vegetable from whence the liquid quintessence was procured, with a little sugar, all mixed together, and distilled by a very gentle heat, till all the moisture is come over; the matter remaining is then a dry quintessence.

This form was deemed principally useful for travellers, sailors, &c., inasmuch as it renders the quintessence portable; so that the quantity, e. gr. of a pin's point, shall be an efficacious medicine.

**Quintessence,** in Alchemy, is a mysterious term, signifying the fifth, or last and highest essence, or power, of a natural body.

This is supposed to be, as it were, the soul drawn from the gross body and its four elements, by a most perfect distillation; and, by means of which, the thing is said to be spiritualized, i. e. rendered exceedingly pure, spiritual, and, as it were, incorruptible.

The ancients, who allowed nothing to be real but what has a body, would have the soul of man to be a fifth element, a kind of quintessence without a name, unknown here below, indivisible, immovable, all celestial, and divine. Fenelon.

**Quintessence of the Elements,** is the hermetical mercury.

**Quintessence of Wine,** a term used by Glauber to express an essential oil of wine, which he directs to be made by a careful distillation; and which he is very fond of, as having a power to meliorate, improve, and even to specify the poorer wines into the nature of those from which it was obtained.

This is one of the schemes of Glauber, generally esteemed an impracticable one, though very plausible in theory; but though in general there is a disagreeable flavour in the quintessence drawn after his method, which is different from the true flavour of the wine, and spoils the liquor it is added to; yet, by proper care, there is a possibility of succeeding so far as to render this extraneous flavour almost imperceptible, and produce an oil that will mend poor wines extremely, and give a truly vinous flavour to such as are in themselves tallowy. But whatever may be done by this method, may also be done with much more certainty, and much less trouble, by the concentration of wines by freezing. This may be easily practiced in the wine countries; and by this means Burgundy, Champagne, and other the most valuable wines, may be reduced into thick extracts and rogs, by the means of which wines may be made in England; a very small quantity of these concentrated wines being sufficient to convert the whole of any of the poor tallowy and inipid wines, which are of themselves of little or no value, into the very wine from which the rob was made; and that in such perfection, that the nicest judge cannot find out the difference.

These robs of wine, made and preserved upon the spot, would also be of infinite use in the wine countries, as they might be kept to improve the wines of bad years. Stahl, De Concentr. Vin. Shaw's Chem. Enl.

**Quint-Exact,** in old Low Books, the last call of the defendant sued to an outlawry. If he appear not to it, he is, by the judgment of the coroners, returned outlawed, if a feme, waived.

**Quint1, Bay of,** in Geography, a bay and harbour in the N.E. part of lake Ontario, at the mouth of the Trent; formed by a large peninsula, confining of the townships of Ameliaburg, Sophiaburg, and Maryburg, extending easterly from an isle, which is a portage at the head, or W. end of the bay, to Point Pleasant, the easternmost extremity of the peninsula, opposite to Amherst island. The river Trent discharges itself into the head of the bay, westward of the portage, and supplies it with the waters of the Rice lake. Westward of the portage in lake Ontario, is the harbour of Prique Ille de Quinté, now called Newcastle. The fertility of the soil about the bay of Quinté is Generally allowed. The land is rich and easily wrought, and produces several crops without manure; 25 bushels of wheat being often
often produced from an acre. The timber, like that of the
other parts of the province, consists of oak, elm, hickory,
maple, &c. The bay is narrow throughout, and about 50
miles long, through which distance it is navigable for the
small vessels that are used on the lakes. It abounds with
wild fowl, and various kinds of fish. The river Trent
affords a salmon fishery. In palling from the head of the
bay of Quinto into lake Ontario, you cross a short portage,
in front of the township of Murray, being the isthmus
between it and the peninsula of Prince Edward. At the
end of the portage, and before you enter lake Ontario, is
a small but very beautiful lake, having very good land on its
banks. To the northward of this portage it has been pro-
posed to make a canal for connecting the waters of the bay
with those of the lake. A little to the westward of the
portage and proposed canal, is the harbour of Newcastile, a
situation well suited for commerce and protection, and
sheltered from all winds. A knoll on the peninsula affords
a healthy site for the town.

QUINTILIUS, Quintilis, in Astronomy, an aspect of
the planets, when they are seventy-two degrees distant from
one another, or a fifth part of the zodiac.

QUINTILIUS, Marcus Fabius, in Biography, a cele-
brated teacher of eloquence, was born about the year 42
of the Christian era, during the reign of the emperor Clau-
dius. He is supposed to have defended from a family ori-
ginally Spanish, but that his father, or grandfather, had
settled in Rome. The place of his birth is not known, but
it seems certain that he was educated in that capital, where
he studied rhetoric under Domitian Afer, a celebrated
orator. He opened a school at Rome, and was the first
who obtained a salary from the state as a public teacher.
After he had remained twenty years in this laborious em-
ployment, and obtained the applause of the most illustrious
Romans, not merely as a preceptor, but as a pleader at the
bar, Quintilian retired to enjoy the fruits of his labours and
industry. In his retirement he assiduously devoted his time
to the study of literature, and wrote a treatise on the
"Causes of the Corruption of Eloquence." Some time
after, he wrote his "Institutiones Oratoriae," the most
perfect and complete system of oratory extant. It is, in
truth, one of the most valuable remains of antiquity. It
was composed for the use of his son, whose early death he
had occasion to deplore, and is an institute for the education
of an orator, whom he takes up from the cradle, and con-
ducts through all the periods of instruction to the exercise
of his proper art. It accordingly contains many excellent
precepts with respect to education in general, especially the
earlier part of it, which are applicable in all times and
countries, as being founded on the nature of the mind.
The style of Quintilian is said, by critics, to exhibit tokens
of the deterioration of the Latin tongue; but, on the other
hand, it must be observed, that every deviation from the
usage of the Augustan age has been too readily regarded as
a depravation. Quintilian was appointed preceptor to the
two young princes whom Domitian dignified for his succesor
on the throne; but the celebrity which the rhetorician re-
ceived from the favours and attention of the emperor, and
from the succesors which his writings met with in the world,
were emblazoned by the loss of his wife, and of his two sons,
one of whom he describes as a prodigy of early excellence.
It is said that Quintilian was poor in his retirement, and that
his indigence was relieved by the liberality of his pupil,
Pliny the younger. He is supposed to have died about the
year 95. His "Institutiones" were discovered in the year
1415, in an old tower of a monastery at St. Gall, by Poggio
Bracciolini. The treatise on the "Causes and Corruption
of Eloquence" has not come down to us. The name of
Quintilian is affixed to certain "Declamations," of which
there are 19 of moderate length; but as the style, method,
and manner, are totally different from the rules laid down
in the "Institutiones," no good judges attribute them to
the name of Quintilian. Of the editions of Quintilian some
of the most valuable are those of Geller, 4to. Gotting. 1738;
of Lug. Batavorum, 8vo. cum notis variarum, 1665; of
Gibson, 4to. Oxon. 1693; and that of Rollin, re-published
in London in 1792. There is an English translation by Mr.
Guthrie.

QUINTILIUS, Quintiliani, in Ecclesiastical History,
a sect of ancient heretics, the same with the Pepuzians;
thus called from their prophetess Quintilia.

In this sect, the women were admitted to perform the
facerdotal and episcopal functions; grounding their practice
on that passage of St. Paul to the Galatians, where he says,
"That in Christ there is no distinction of males and females."
In their assemblies, it was usual to see the virgins enter
in white robes, perforating the prophetesses. The Quin-
tilians bore some resemblance to the modern Quakers.

QUINTILIS, in Chronology. See July.

QUINTIN, or Quin, in Commerce. See Quentin.

QUINTIN, in Geography, a town of France, in the
deptartment of the Northern Coasts, and chief place of a
canton, in the district of St. Brieuc; nine miles S.W. of St.
Brieuc. The place contains 3976, and the canton 12,510
inhabitants, on a territory of 147½ square miles, in eight
communes.

QUINTINIE, John de la, in Biography, famous for
his skill in horticulture, was born at Poitiers in 1626.
He received a learned education, and was brought up to the
profession of the law, in which he gained reputation as a pleader
at the bar. A passion for agricultural knowledge led him
to study, with great attention, all the authors, ancient and
modern, upon that topic; and on a visit to Italy as tutor to
a youth, he made great additions to his knowledge from
actual observation. On his return he devoted himself almost
entirely to experiments on the culture of trees and plants,
and made many discoveries which greatly improved the art
of gardening. He was the first person who laid down just
principles of the art of pruning fruit-trees. He also
remarked that a transplanted tree grew only by the new roots
which it threw out, and that the old fibres were useless,
and ought to be cut off. It does not appear at what time he
began to follow gardening as a profession, but he had cer-
tainly acquired a high degree of reputation in it when he
was invited to England by Charles II. who offered him
a considerable pension to engage him in his service. He
twice visited London, and a paper of his was published in
the Philosophical Transactions, on the culture of melons.
He was made, by Lewis XIV., director-general of the
gardens in all the royal palaces. In 1668 he published
"Instructions pour les Jardins Fruissiers et Potagers," which
obtained a high degree of popularity, was frequently re-
printed, and was translated into several modern languages.
The last edition was entitled "Parfait Jardinier," in two
vols. 4to. The author died at Paris in the year 1700.

QUINTO, in Geography, a town of Spain, in Arragon;
20 miles S.E. of Saragossa.

QUINTUS CALABER, in Biography, a Greek poet,
who wrote a supplement to Homer's Iliad, in 14 books,
in which a relation is given of the Trojan war from the death
of Hector to the destruction of Troy. He is suppos-
ed, from the style of his work, to have lived in the fifth
century, but nothing certain can be collected concerning his
person and country. His poem was first made known by
cardinal Bellarion, who discovered it in St. Nicholas' church, near Otranto in Calabria; hence the author was named Quintus Calaber. It was published at Venice by Aldus, but there is no date attached to the title page.

**Q U I**

**QUINTUS CURTIUS.** See Curtius.

**QUINTUS FEMORIS, in Anatomy,** a name given by Fallopius and many others to one of the muscles of the thigh, now called the plosus magnus.

**QUINTUS OCULORUM,** a name given by Vefalius and some others to one of the muscles of the eyes, more expressively called by others obvius superior oculi, and opifex circumgyrationis oculi.

**QUINVA,** in Botany, a name by which some authors have called the amaranth, or cockcomb.

**QUINZANO,** in Geography, a town of Italy; 18 miles S.W. of Brescia.

**QUINZIEME,** Fr. in Music, the double octave, above or below any found (see Fifteenth); which is the name of a stop in our organs, equidistant from the diapason.

**QUIOPELA,** in Zoology. See Viverra Mungo.

**QUIPOS,** in Literary History, a name given to knots on cords of different colours, in Peru, which imperfectly supplied the place of writing. This device was adopted, as it has been said, for rendering calculation more expeditious and accurate. The various colours denoted different objects, and each knot expressed a distinct number. Thus an account was taken, and a kind of register kept of the inhabitants in each province, or of the several productions collected there for public use. But as these knots, however varied or combined, no moral or abstract idea, no operation or quality of the mind could be represented, they contributed little towards preserving the memory of ancient events and institutions. The Mexican paintings and symbols, rude as they were, conveyed more knowledge of remote transactions than the Peruvians could derive from their booted quipos. If, indeed, the latter had been of more extensive use, and better adapted to supply the place of written records, they perished so generally, together with other monuments of Peruvian ingenuity, in the wreck occasioned by the Spanish conquest, and the civil wars subsequent to it, that no accession of light or knowledge is derived from them. Robertson's Hist. Amer., vol. iii.

**QUIQUI,** in Zoology, a species of Musflea; which see.

**QUIRAZAL, or CURRAZ, in Ornithology.** See Cran Alco. or Cran Alco.

**QUIRE of Paper,** of the French cabier, the quantity of twenty-four or twenty-five sheets.

**QUIRICA,** a name given by some to the stone called quiris by the generality of writers.

**QUIRICU,** in Geography, a town of France, in the department of the Iere; 12 miles E. of Bailly.

**QUIRINACIUM OPUS,** in the Materia Medica, a name given by some to the gum we know by the name of asa ficta.

**QUIRINALIA,** in Antiquity, feasts celebrated, among the Romans, in honour of Romulus, who was called Quirinus. See Quirites.

The Quirinalia, called also flutorum sere, were held on the 13th of the calends of March, i.e. on our 17th of February.

**QUIRINI, ANGIOLO-MARIA,** in Biography, a learned cardinal, by defeat a Venetian, was born in the year 1685. While young he entered into the order of the Benedictines of Monte Cassino. At Florence he pursued a very extensive course of study under several of the most eminent men in science and literature of that age.

Upon his entering a profeship in his convent, he delivered an oration "De Moificio Historiz Preftantia," which was printed. His studies were interrupted some time, by an imagination that he was afflicted with a stone in his bladder; but the death of his physician, who fell a victim to a false impression respecting his own face, freed him from his fancied complaint, and in the year 1710 he set out upon his literary travels. He visited Germany, Holland, England, and France, making in the latter country an abode of more than two years, during the greatest part of which time he resided in the Benedictine abbey of St. Germain des Pres. In the course of his travels he formed an acquaintance with almost all the literary characters in those countries, and visited every object of learned curiosity, at the same time every where exciting a general eftrem of his talents, his industry, and his conduct. Upon his return to Italy he published a Dissertation containing a Plan for a History of Italy;—an Essay on the History of Farfa, in the Duchy of Spoleto;—and an edition of the Office for Divine Service according to the Use of the ancient Greek Church. He was soon after created bishop of Corfu, by pope Innocent XIII., a dignity which he filled in such a manner as to inspire the Greek separatists with veneration for his person. His residence in Corfu was the cause of his composing a learned work, "Primordia Corcyre ex antiquissimis Monumentis illustrata," 4to. 1725.

In the year 1727, Benedict XIII. raised Quirini to the cardinalate, after having nominated him to the bishopric of Brescia. His promotion to that see was followed by some publications relative to the literature of Brescia. His attachment to the see of Rome was displayed by a life of pope Paul II. printed in 1740, the object of which was to defend the memory of that pontiff against the attacks of Plinio. Soon after this he was appointed librarian to the Vatican; in this and other posts he continued to serve the cause of literature. It was through his means that a new edition of the works of St. Ephrem was given in 6 vols. fol. in the Greek, Syrian, and Latin languages. He likewise edited the letters of cardinal Pole, written against the principles of the reformers. This prelate died, greatly regretted, at his episcopal residence, in 1755, at the age of 75. Though a vigorous champion of the papacy, he wrote with a spirit of candour and moderation, which obtained the applause of the Protestants themselves. He was associated to several literary societies, among which were the academies of Peterburg, Berlin, and Vienna, and the Institute of Bologna. He enjoyed a large revenue, which he expended with munificence, on objects of charity and public splendour. At Rome he beautified the church of St. Mark, whence he derived his cardinal's title, and he contributed liberally to the fine Catholic church at Berlin. He laid the foundation, by a valuable gift of books, of a public library at Brescia. His own select and valuable library he presented to the Vatican. His charities were numerous and extensive, and he was indefatigable in performing his pastoral duties, visiting the alpine parts of his diocese in the most inclement seasons. Besides the works already mentioned, he published an account of his own life, and a narrative of his travels.

**QUIRIQUING,** in Geography, an island on the coast of Chili, near the entrance into the bay of Concepcion. S. lat. 36° 35'.

**QUIRIS, Quirisus lapis,** a name given, by the writers of the middle ages, to a stone famous among them for its imaginary virtues, but of which they have left us no description.

**QUIRISTER, CHORISTER, or Chorista,** a person appointed
pointed to sing in the quire, or choir, of a cathedral. See Anthem, Chantor, and Choir.

Quirites, in antiquity, an appellation given to the people of Rome, chiefly the common citizens, as distinguished from the soldiers.

It took its rise from the Curetes, the inhabitants of the Sabine town Cures. On this occasion Romulus, and Tatius king of the Sabines, having united their two people, and their two flates, into one; upon Romulus's death and defection, the Sabines, outdoing the Romans in number, became masters of the councils; and accordingly appointed, that Romulus should be denominated Quirinus, from Cures, a city of the Sabines; or rather from Quirinus, the name of a god worshipped in that city.

From the new Quirinus, all the people came afterwards to be called Quirites; unless we will suppose, that the same authority which denominated Romulus Quirinus, from Cures, did also denounce the people Quirites, immediately from the Curetes.

Some authors derive the word Quirinus from Curis; which, in the Sabine tongue, figured a pike, or halbert. Struvius adds, that Romulus was always painted with a pike in his hand.

Julius Cæsar, as Tacitus informs us, (Annal. i. 43.) appeared a sedition by the use of this word Quirites, which opposed to soldiers, expressed contempt, and reduced the offenders to the less honourable condition of mere citizens. The emperor Alexander also applied it to the same purpose. See his biographical article.

Quirk, in building, a piece of ground taken out of any regular ground-plot, or floor. Thus, if the ground-plot were square, or oblong, and a piece be taken out of a corner, to make a court, or yard, &c. the piece is called a quirk.

Quiroga, in Geography, a town of Spain, in Galicia; 24 miles N.E. of Orense.

Quiros, Cape, lies on the E. coast of the island of Efpiritú Santo, in the South Pacific ocean. S. lat. 14° 56' 8"; E. long. 167° 20'.

Quirpele, in zoology, the name of a small animal, called by some authors the Indian ferret, or viverra Indica, and by others guilt. See Viverra Mungo.

Garcia and some authors give very remarkable accounts of the eminence this creature has to ferrets of all kinds. They tell us, that when this little creature intends an attack upon one of these animals, it first prepares against danger, by gnawing a quantity of the root of the lignum colubrinum, or snake wood; and when it has thoroughly impregnated its fæva, it wets with it first its fore-feet, and with them daubs over its head and its whole body; and that thus prepared, it boldly attacks the snake, and never leaves off till it has killed it. Garcia affirms us, that many of the Portugueze have been eye-witnesses of these combats.

It is probable enough, that this creature may attack a snake when thoroughly hungry, knowing its flesh to be good food; but the story of the antidote is to be suspected. See Ichneumon.

Quirpen, in Geography, an island in the North Atlantic ocean, near the N. coast of Newfoundland. N. lat. 51° 40'; E. long. 52° 22'.

Quirsvyk, a town of Norway; 60 miles N.E. of Romfidal.

Quis, in Natural History, a kind of marcasite of iron or copper, from which vitriol is drawn. It is more frequently called pyrites.

Quisbro, in Geography, a town of Sweden, in Nericia; 12 miles S.W. of Örebro.

Quiscalus, in Ornithology, a species of Gracula; which see.

Quisibi, in Geography, a town of Arabia, in the province of Oman; 180 miles W. of Julfar.

Quisil auren, a town of Asiatic Turkey, in Caramania; 15 miles W. of Cogni.

Quisongala Islands, a cluster of small islands in the Indian sea, near the coasts of Africa. S. lat. 10° 40'.

Quispichanchi, a jurisdiction in the diocese of Cufco in Peru, beginning at the four gates of Quito, and stretching from E. to W. about 20 leagues. The lands of this jurisdiction belong, in general, to the richer inhabitants of Cufco, and produce plenty of wheat, maize, and fruits.

Here are also manufactures of baize and coarse woollen stuffs. Part of the jurisdiction borders on the forests inhabited by wild Indians, and produces great quantities of coca, or cacao, an herb greatly used by the Indians working in the mines, and forming one of the principal branches of its commerce; the town lies 12 miles S. of Cufco.

Quisqualis, in Botany, a name combined by Rumphians of quis, who, and qualis, what kind or manner, by which he intended to express the singular variableness of the plant, as if nothing could be found like it.—Linn. Gen. 215; Schreb. 292. Wildl. Sp. Pl. v. 2. 579. Mart. Mill. Dict. v. 4. Julf. 78. Lamark Illuftr. t. 357; Clafs and order, Decandria MonogaMy. Nat. Ord. Ver. p. 109; Linn. Thyrselce, Julf.

Gen. Ch. Cal. Perianth inferior, tubular, thread-shaped, very long, deciduous, its border in five spreading segments. Car. Petals five, inserted into the mouth of the tube, femail, oblong, obtuse, spreading, much larger than the segments of the calyx. Stam. Filaments ten, bristle-shaped, inserted into the tube of the calyx, five of them below the vent, others oblong, or in above the mouth of the tube. Pist. Germen superior, ovate; style thread-shaped, longer than the stamens; stigmas obtuse, dilated. Peric. Drupa dry, with five unequal angles. Seed. Nut elliptic-oblong, penta-gonal.

Eff. Ch. Calyx with a thread-shaped tube; five-leaved. Petals five. Drupa superior, with five angles.

1. Q. indica. Linn. Sp. Pl. 556. (Quisqualis; Rumph. Ambv. v. 5. 71. t. 48. Q. pubescens; Burm. Ind. 104. t. 35. f. 2, and Q. glabra; t. 28. f. 2.)—Native of Java, and the Molucca isles; naturalized by Rumphius in Amboyna. The fæm is shrubby, at first low and flumpy, but subsequently throwing out long trailing or twining shoots, which become as thick as a man's arm. To this diversity of habit, and the changeable hue of the flowers, the name alludes. The young branches are clothed with fine soft down. Leaves opposite, occasionally scattered, on shortish downy stalks, ovate, pointed, entire, two or three inches long; their ultimate veins finely reticulated; both surfaces more or less downy, rarely smooth. Flowers in axillary or terminal branched spikes. Bracteas ovate, downy. Corolla two inches long, downy, whitish in the morning, turning pale red in the afternoon, rofe-coloured in the evening, and the next morning of a blood red. Fruit as big as one joint of the finger. Nut eatable when quite ripe, having the flavour of a filbert. When unripe, Rumphius compares its taste to that of a radish. These nuts are a popular remedy, among the Malays, for worms in children. Two or three of the pungent unripe ones, or five of those that are arrived at maturity, are a dose. Some persons are attacked with a dangerous hiccup from eating two or three of the nuts in question, whilst others find no such effect from a considerable number. The integuments are carefully removed. They probably partake of the poisonous
poisonous qualities of the Mezereon tribe; though in a mild degree, as Rumphius speaks of the flavour of several parts of the plant, without mention of any very hurtful properties. Even the kernels of our European Daphne are highly acrimonious.

QUIQUISANA, in Geography, a town of Peru, in the diocese of Cufco; 32 miles S.S.E. of Cufco.

QUISSAC, a town of France, in the department of the Gard, and chief place of a canton, in the district of Le Vigan, having a mineral spring; 20 miles N. of Montpellier. The place contains 1310, and the canton 3884 inhabitants, on a territory of 160 kilometres, in 12 communes.

QUISTELLO, a town of Italy, in the department of the Milan; 15 miles S.S.E. of Mantsua.

QUISTORP, John, in Biography, a German Lutheran divine and professor, was born at Rollock in the year 1584. He pursued his academical studies at his native city, at Berlin, and at Frankfort on the Oder; and afterwards travelled through Holland, Brabant, and Flanders, in the capacity of governor to the son of a patrician of Lucbc. In 1614, his learning and abilities pointed him out as a fit person to fill the divinity chair at Rollock; but before he entered upon the duties of his office, he was created doctor of divinity. He obtained other preferments in the church, particularly the archdeaconry of St. Mary’s at Rollock. In 1645 he was appointed pastor of the same church, and superintendent of the churches in the district of that city. He had the felicity of rendering important services to the celebrated Hugo Grotius, during his last fatal illness at Rollock. Upon the death of that great man, he wrote a Latin letter to Calovius, containing an account of his kindness and last sentiments, which is inserted in the “Bibliotheca Choifée” of Colomes; and in the “Vindiciae Grotianae,” under the title of “Grotii Manes.” Quistorp died in 1648, at the age of 64. He was the author of “Annotationes in omnes Libros Bibliicos,” “Commentarium in Epitola Sancti Pauli,” and several other works. He left a son of the same name, who was born at Rollock in 1624, and died in 1669. He became pastor, professor of divinity, and rector of the university in that city.

QUISTRUM, in Geography, a town of Sweden, in the province of韦est Gotland; 5 miles N.W. of Uddevalla.

QUITANGONE, a river of Africa, which runs into the Indian sea, 15 miles N. of Mozambique, S. lat. 14° 40'.

QUITAPABILLA, a river of America, being a branch of the Swetara, which falls into the Sulqueannah at Middleton.

QUITAPORA, a town of the state of Georgia. N. lat. 33° 25'. W. long. 80° 58'.

QUITCH, in Agriculture, a name frequently applied, in many districts, to a very troublesome set of plants of the weed kind; for though it properly belongs to the couht-grafs plant only, it is much used to defign other of the creeping perennial rooted fort, as the bent, creeping, soft, and tall oat-grafs, as well as others, which are only capable of being destroyed by repeated summer ploughings, or forking them out and burning them on the ground. See COUCH.

QUITCH-GRAFS, the common name given in some places to a very troublesome weed of found, in various districts, and which requires great exertion to eradicate it out of the land. See COUCH.

QUITCH-DRAFS, that ferrt of useful tool of the drag-kind, which is employed in the dragging out and removing this ferrt of weed from ploughed lands. It is made in several different methods, according to circumstances; but has mostly something of the long triangular form in the beam part, into which the teeth or tines are fixed. These are seldom made so large in this as in the heavy ferrts of drag; but they are mostly a little hooked, or bent forward, towards the points or lower ends. The frame-part is sometimes fitted with two rows of tines, or more.

It is a ferrt of tool which is frequently made ufe of for rendering arable ground perfectly clear of root weeds, being had recourse to before the late ploughings. Where the land has been crois-ploughed, this kind of drag may be employed with great advantage in bringing it into proper order. It has some other names in different counties. See COUCH-DRAFS, and DRAG.

QUITCH-RALES, a name given in many districts to the rake used in collecting the weed called couch, from the surface of ploughed ground, as well as some other ferrts in particular cases. The head of this tool, into which the teeth or tines are fastened, is usually about five feet in length; the tines are made in a round form, having a projection of about eighteen inches below the head, each being gradually turned or crooked forward about two inches; the distance from each other also about two inches. There is commonly a small beam made to fasten in the middle with two pieces of wood, which come from each corner of the rake-head, into which the tines are fastened by means of a pin that goes through the beam, and keeps the rake steady. In working, this implement may be put on the carriage-part of a two-wheeled plough, to be drawn by one horse; a man going behind to occasionally lift up the rake when full, in order to leave the couph and other weeds in rows, for the purpose of burning them. In this manner, a great deal of weeds and trumpery may be collected together in the course of a day. See COUCH-grafs Rake.

QUIT-CLAIM, a release, or quitting one’s claim or pretensions to a thing.

QUITERVA, in Geography. See SOFALA.

QUITEVA, or KITEA, a town of Africa, in the country of Darah, defended by a castle; 75 miles S.E. of Morocco. N. lat. 28° 6'. W. long. 5° 26'.

QUITO, an extensive province of South America, which was subject to the Peruvian empire, by Huana Capac, about the year 1526, at the time when the Spaniards first visited the coast of Peru. Huana prevailed on his immediate and eldest son Huncan to allow one of his natural children, Atahualpa, by the daughter of the last king of Quito, to hold this kingdom as a vassal of the empire. Atahualpa, however, rebelled, fized the empire, emplimned his brother, and soon after put him to a violent death. His prosperity was of short duration; for in the year 1535 he suffered the same fate, by order of Don Francisco Pizarro, who had deputed Sebastian de Benalcazar to conquer the kingdom of Quito. Having by a series of victories made himself master of the kingdom, he proceeded in the year 1534 to rebuild the capital, which had suffered much from internal communions, and called it “San Francisco de Quito,” a name which it still retains, though it was not till seven years after this date that it obtained the title of city. The province, which the Spaniards found annexed to the kingdom of Peru, continued in that state till the year 1718, when it was daimonized from Peru, and attached to the viceroyalty of New Granada. At the same time the audience of Quito was suppressed, together with that of Panama, in the kingdom of Terra Firma: though the latter continued dependent on the viceroys of Lima. See NEW GRANADA and PERU.

This province is bounded to the north by that of Santa Fe de Bogota, and includes part of the government of Popayan; on the south it is limited by the governments of Peru
Quito.

The capital of the above described province, rebuilt in the year 1534, (see the preceding article,) and situated in the inland parts of the continent of South America, on the eastern skirts of the West Cordillera of the Andes; distant from the coast of the South sea about thirty-five leagues to the west. On the N. W. is the mountain and desert of Pichinche (which fea), on the acclivity of which the city is built, and also among the breaches that are formed by the eminences of this mountain; so that many of the buildings stand upon arches, and the streets are of course very irregular and uneven. With regard to magnitude, this city may be compared to one of the second order in Europe; but the unevenness of its situation is a great disadvantage to its appearance. Near the city are two spacious plains, one on the S., called Turu-bamba, three leagues in length; and the other on the N., termed Inna-Quito, about two leagues in extent; both of which are intermixed with fields and cultivated lands, which much contribute to the variety and beauty of the scenery. These plains contract as they approach the city, and at their junctions form a tract of land, covered with the eminences on which part of Quito stands. The principal square in Quito has four sides, in one of which stands the cathedral, and in the opposite the episcopal palace; the third side is taken up by the town-house, and the fourth by the palace of the audience: this square is very spacious, and has in its centre an elegant fountain. The four streets terminating at the angles of the square are straight, broad, and handsome; but at the distance of three or four quadras, (each quadra being about one hundred yards,) the troublesome declivities commence; and on this account the inhabitants cannot enjoy the benefit of coaches, or wheel carriages. The principal streets are paved; and those which are not paved are almost impassable after rain, which is here very common. Besides the principal square, there are two others, that are very spacious, and several that are smaller. In these most of the convents are situated, and these make a handsome appearance, and some of them, particularly that of the order of Franciscans, are elegant structures. The principal houses are large, and some of them have spacious and well-appointed apartments, though none are above one story in height, but their doors and windows are low and narrow. The materials made use of in building at Quito are "adobes," or unburnt bricks and clay, cemented by a substance called "fangay a," a species of mortar that is uncommonly hard, used by the ancient Indians for building all kinds of houses and walls. The city is divided into seven parishes; the cathedral is richly adorned with tapestry hangings and other costly decorations; but the parish churches are of mean appearance. The convents of monks are those of the Augustines, Dominicans, and Fathers of Mercy, &c. colleges, &c. Quito has also several numeraries. The college of Jesuits, as well as all the convents of monks, are large, well built, and very splendid. Here is also an hospital, with separate wards for men and women, under the name of the order of our Lady....
of Bethlehem. Among the courts whose seions are held at Quito, the principal is that of the Royal Audience, establishe there in 1563; the exchequer or chamber of finances, a treasury for the effects of persons deceased, &c. The corporation consists of a corregidor, two ordinary alcaldes chosen annually, and regidores. The cathedral chapter consists of the bishop, dean, archdeacon, chanter, treasurer, a doctoral, a penitentiary, a magislar, three canons by presentation, four prebends, and two demi-prebends, with the following salaries; that of the bishop $24,000 dollars, the dean $500; the four succeeding dignities, $3000 each, the canons $1500 each, the prebends $600, and the demi-prebends $400. This church was created into a cathedral in 1545, and among other festivals celebrated in it, the most magnificent are those of Corpus Christi, and the Conception of our Lady, when all the courts, offices, and persons of eminence assist. In the former there is a singular pomp of the procession of the host, and here are also dances of a peculiar nature, which were performed before their conversion to Christianity. The corporation and cathedral chapter keep, by vow, two annual festivals in honour of two images of the Virgin, which are placed in the villages of Guapulo and Quirincha, belonging to this jurisdiction. These images or statues are brought with great solemnity to Quito, and each festival is succeeded by nine days' devotion, the audience and other courts afflicting on the occasion. These festivals are held in commemoration of the assistance vouch- safed by the holy Virgin, at the time of an earthquake and terrible ejection from Pichincha, by which Latacunga, Hambato, and a great part of Riobamba, were utterly destroyed; whereas by the supposed interposition of the Virgin, the city escaped even the slightest damage.

The celebrated city of Quito is said by Alcedo to contain 58,000 persons, some of whom are distinguished by their rank. These are the descendants either of the original conquerors, or of other persons who in succeeding times came over from Spain invested with some lucrative office, and who have preferred the lucre, both of their decent wealth, by intermarriages, without mixing with meaner families though famous for their riches. The lower orders of people consist of four classes, Spaniards or whites, Mefitizos, Indians or natives, and Negros, with their progeny. The former, according to the statement of Uleoa, compose about a sixth part of the population; the Melissaos, or descendants of Spaniards and Indians, amount to about a third part; the Indians form another third; and the others, who are about one-sixth, are the Cafts. The Spaniards are prevented by their pride from applying to any kind of busines, and therefore many of them are poor and wretched. The Melissaos occupy themselves in arts and trades, but principally in those of the highest repute, such as painting and sculpture, in which they excel. These men of talents, however, are indolent and slothful, so that they loiter about the streets during the whole day. The Indians, who are generally shoemakers, bricklayers, weavers, or engaged in similar occupation, are not more industrious. Persons of fortune among the Spaniards affect great magnificence in their dress, wearing the finest gold and silver tilities; but that of the middling and lower class is a black cloak, and under it a long coat, reaching down to their knees, with a close sleeve, open at the sides, without folds, and ornamented with rows of buttons. The Melissaos generally wear blue cloth, manufactured in this country. The dress of the Indians consists only of white cotton drawers, made either from the fluffs of the country, or from others brought from Europe, reaching down to the calf of the leg, and edged with lace suitable to the stuff. The use of a shirt is supplied by a black cotton frock, wove by the natives; and over this is a kind of ferge cloak, through which the head paffes, and a hat made by the natives. The men, both Creoles and Spaniards, are well made, of a proper stature, and of a lively agreeable countenance. The Melissaos in general are also well made, often taller than the ordinary size, very robust, and have an agreeable air. The Indians, both men and women, are generally low, but well proportioned and very strong. The Indians have no beard, nor have either males or females any indications of the age of puberty. The youths of family are instructed in philosophy and divinity, and some, with reluctance, proceed to the study of the civil law. The country is observed to abound more in women than men; and it is observed, that nature begins to decay at the age of thirty in the male sex, especially among those who have been tenderly brought up; whereas the females enjoy a more confirmed state of health and vigour. This difference is ascribed partly to the climate and partly to the food, but principally to early intemperance and voluptuosities, and also the want of proper employments. The liquors that are used here are rum and brandy, in which they freely indulge, and also the infusion of the Paraguay herb, which serves for tea. The vices prevalent here are dice-los, drunkennes, and gaming. The common people and Indians are much addicted to theft, in which they are very artful and dextrous. In Quito, and in all the towns and villages of its province different dialects are spoken, Spanifh being no less common than the Inga.

Quito is so happily situated, that neither the heat nor cold is troublesome; though the extremes of both may be felt in its neighbourhood. An equality of temperature takes place throughout the whole year, the difference between the mornings being scarcely perceptible. The winds are fabricious, and blow continually, but never with any violence. The rain occasionally descends in impetuus torrents. Earthquakes are not uncommon, and when they occur very violent; that of 1775 was very destructive. The great earthquake on the 4th of February 1797, which changed the face of the whole province, and in one instant destroyed thirty-five or forty thousand persons, has so altered the temperature of the air, that the thermometer is now commonly 41° to 54°, and seldom rises to 68° or 70°; whereas Bouguer observed it constantly at 66° or 68°. Since this catastrophe earthquakes are continually recurring; and such shocks, it is probable, that all the higher ground is one vast volcano. Von Humboldt adds, that what are called the mountains of Cotopaxi and Pichincha are but little summits, the craters of which form different conduits terminating in the same cavity. The earthquake of 1797 afforded a melancholy proof of this; for the ground then opened every where, and vomited forth sulphur, water, &c. Notwithstanding the dangers and horrors that surroun, the people of Quito are gay, lively, and variable, and very much addicted to pleasure, luxury, and amusement. Humboldt informs us, that the volcanos of Quito eject pumice, basalt, and porphyry, &c.; with enormous quantities of water and liquid clay, which diffuse fertility eight or ten leagues round. The fertility of this country is such, that, as we are informed, a full description of it would appear incredible. The equality of the climate, as well as the fertility of the soil, occasion a regular succession of the productions of the earth: when the fruits have obtained their maturity, and the leaves begin to change their colour, fresh leaves, blossoms, and fruits, are seen in their proper gradations on the same tree. The fame incessant fertility is conspicuous in the corn, reaping and fowing being both carried on at the same time. This remarkable fecundity of the soil is naturally productive of excellent
excellent fruits and corn of every kind, as is evident from
the delicacy of the beef, veal, mutton, pork, and poultry
of Quito. One of the principal foods used by the inhabi-
tants is cheese, of which it is computed that the quantity
annually consumed amounts to between seventy and eighty
thousand dollars of the money of that country. The vicin-
ity also affords excellent butter. The manufactures of this
province are cottons, some white, called tucuyos, and others
striped bays and cloths, which meet with a good market
at Lima, for supplying all the inward provinces of Peru ;
and the returns are made partly in silver, and partly in gold
and silver fringes made in that city, wine, brandy, oil, copper,
tin, lead, and quicksilver. The products of the earth are
chiefly consumed within the province; except the wheat,
part of which is sent to Guayaquil. But this trade is
carried on by Metzigos and poor people. Goods, manu-
factured by the public, or woven by private Indians, are sent,
together with some kinds of provisions, to the jurisdic-
tion of Barbascoas. These provisions are exchanged for gold, found
in that country, and which is afterwards sent to Lima, and
disposed of at a greater price. Their stuffs find a vent in
the governments of Popayan and Santa Fé. The coast of
New Spain supplies this province with indigo, of which a
great quantity is consumed; blue being universally the col-
our which these people affect in their apparel. They also
import, by way of Guayaquil, iron and steel, both from
Europe and the coast of Guatamala. S. lat. 0° 13' 27".
W. long. 78° 10' 15". Ulloa's Voyage, vol. 1.
QUIT-RENT, q. d. quiet rent, a certain small rent,
payable yearly, by the tenants of moft manors, in token of
subjection; upon the payment of which, they are quiet, and
free. It includes both rents of affile and chief rents.
These rents differ very greatly in different manors, being
in some a mere trifle, while in others they are very heavy
and oppressive to the tenants. This part of the feudal
system is now considerably on the decline.
In some ancient records it is written white rent, because
paid in silver, to distinguish it from rent-corn, rent-pepper,
&c.
QUITTA, in Geography, a town of Africa, on the
Slave coast. N. lat. 6° E. long. 0° 8'.
QUITTANCE. See Acquittance.
QUITTER, or Quittor, in hores, is an ulcer formed
between the hair and hoof, usualy on the inside quarter
of a horse's foot; it often arises from treads and bruises,
sometimes from gravel, which by working its way up-
wards, lodges about the coronet; if it is only superficial,
it may be cured with cleansing dressings, bathing the coronet
every day with spirits of wine, and dressing the fore with
lime-water, or a detergent application, such as red precipi-
tate. But where the matter forms itself a legement under
the hoof, there is then no way to come at the ulcer but by
taking off part of the hoof; and if this be done well, the
cure may be effected without danger.
When the matter happens to be lodged near the quarter,
the farrier is sometimes obliged to take off the quarter of the
hoof, and the cure is then for the most part palliative;
for when the quarter grows up, it leaves a pretty large seam,
which weakens the foot; this is what is called a false quarter,
and a horse with this defect seldom gets quite found.
If the matter, by its confinement, has injured or destroyed
the coffin-bone, which is of so soft and spongy a nature that
it soon becomes cavernous, it will be necessary to enlarge the
opening, cut away the spongy flesh, and apply the actual
cautery, or hot iron, pointed pyramidically, dressing the
bone with dofts of lint dipped in tincture of myrrh, and
the wound with the green or precipitate ointment. When
the fore is not enlarged by the knife, which is the best and
least painful method, sublimate is generally applied; or blue
vitriol powdered, and embued with a few drops of oil, is
also used for this purpose, and is paid to act as effectually,
and with less pain to the animal.
In the time of the action of these caustic remedies, the
foot should be kept in a poultice. And where sinuses form
they should be laid open by a knife, and be afterwards stimu-
lated by the application of some detergent remedy. The
following has been advised by a late writer: Take of corro-
vive sublimate, red precipitate in fine powder, of each equal
parts; honey sufficient to form a paste.
The wound is advised to be afterwards dressed with com-
mon digestive ointment, preferable being given by means of a
bandage. It is sometimes written quitter.
QUITER-BONE, another term applied to the same diseae
by farriers and perfons engaged in husbandry.
QUITY, in Botany, a Brazilian name used by some au-
thors for the sapindus, or soap-berry tree of the West
Indies.
QUIVER, seemingly corrupted from the Fr. couvrir,
to cover, a cag or sheath for arrows.
QUIVISA, in Geography, a town of Hindostan, in
Babur; 25 miles S. W. of Bettyah.
QUIVISIA, in Botany, from the vulgar name of this
tree or shrub in the isles of Bourbon and the Mauritius,
bos de guaiwi. Juf. Gen. 264. Cavan. Diff. 367. (See Gil-
LIBERTIA.) One cannot but wonder how a writer of Juf-
fiets's learning could, for a moment, tolerate fo faulty a
name; especially as his authority leads heedlefs perons into
the adoption of such, for want of reading his preface;
where, in a note to p. 24, he declares these rude and bar-
barous names to be merely borrowed for a time, till the gen-
era to which they belong are better determined.
QUIXOS, in Geography, a jurisdiiction of South Ame-
rica, attached to the province of Quito, on the east side of
the Cordillera of the Andes. Quixos on the north side bor-
ders on the jurisdiction of Popayan; reaching caightward to
the river Aguarico, and towards the west separated from the
jurisdictions of Quito, Latacunga, and the town of San Mi-
guel de Ibarra, by the Cordilleras of Cotopaxi and Cayam-
buro. This country was first discovered in 1536, by Gonzalo
de Pineda, one of the officers sent from Popayan by Sebastian
de Belalcazar (or Benalcazar), to trace the course of the river
Magdalena; and in consequence of his report, Gonzalo Pi-
zaro, in 1539, reconnoitred its whole extent, and esta-
blisbed settlements in it. But upon the failure of his expe-
tration, the conquest of this country was suspended till the
year 1549, when the marquis de Canete, viceroy of Peru,
gave a commision to Gil Ramirez Davalo, a man of un-
daunted courage, for reducing the Indians, and making set-
tlements in the country. This object he accomplished;
and founded the town of Ibarra, the capital of the govern-
ment, in the year 1559; and this was soon followed by other
towns and villages, the principal of which are Archidona
and Avila. The temperature of this country is hot and
moist, the rains being almost continual. It is covered with
thick woods, some trees being of a prodigious magnitude.
In the S. W. part of the jurisdiction of Quixos is the canela
or cinnamon tree, which led Gonzalo de Pineda to call the country
Canos, a name which it still retains. The other products
of Quixos are the fame with those in all the other lands under
the frame climate as this government. Adjoining to this is the
district of Macas and Maynas. See MACAS and MAYNAS.
QUIZA, in Ancient Geography, a town of Africa, in
Mauritania Cufariaenis. This was a fortres, according to
Pomponius Mela and Pliny. Antonine makes it a muni-
cipium, and places it between Portus Magnus and Arbe-
naria.

QUIZAMA,
QUIZAMA, in Geography, a province of Africa, in the southern part of Angola; the country is extensive, mountainous, and badly cultivated; but it produces abundance of honey, wax, and salt. The inhabitants are warlike, and have not submitted to the Portuguese.

QUIZIBA, a small island in the Indian sea, near the coast of Africa. S. lat. 12° 30'.

QUIZIMAJOGO, a river of Africa, which discharges itself into the Indian seas, S. lat. 8° 50'.

QUIZIMA, or Teusin, a chain of mountains in Fez, 90 miles in extent.

QUIZUMGO, a river of Africa, which runs into the straits of Mozambique, S. lat. 17° 20'.

QUO JURE, in Law, a writ that lies for him who has land, wherein another challengeth common of pasture time out of mind: its design is to compel the party to fly by what right or title he challengeth it. This is now out of use, as, on the claimant's putting his cattle in, the owner may bring trespass, when the claimant must plead and prove his title.

Quo Minus is also a writ which lies for the king's farmer or debtor in the court of eschequer, against him to whom he feltheth any thing by way of bargain, touching his farm, or against whom he hath any cause of personal action; because by the vendee's detaining any due from him, the farmer is les able to pay the king's rent. This was formerly allowed only to such persons as were tenants or debtors to the king: at this day the practice is become general for the plaintiff to furnish, that, for the wrong which the defendant doth him, he is les able to satisfy his debt to his majesty; which furnish gives jurisdiclion to the court of eschequer to hear and determine the cause. Finch. 66. Old N. B. 148.

Quo minus is also a writ that lies for him who has a grant of house-bote and hay-bote in another man's woods, against the grantor making such waife, as that the grantee cannot enjoy his grant.

Quo Warranto, a writ that lies against any person or corporation (which fee) who usurps any franchise, or liberty, against the king; as to have waive, flary, fair, market, court baron, leet, or such-like, without good title; to inquire by what authority he supports his claim, in order to determine the right. Finch. L. 322. 2 Inst. 258.

It also lies for mid-inter or non-inter of privileges granted; and even, according to Bracton, against him that intrudeth himself as heir into land. See Intrusion.

This writ was originally returnable before the king's justices at Westminster; but afterwards only before the justices in eyre, by virtue of the statutes of "quo warranto," 1 Edw. 1. c. 1. and 18 Edw. 1. ft. 2. (2 Inst. 498. Rath. Entr. 540.) but since those justices have given place to the king's temporary commissioners of affize, the judges on the several circuits, this branch of the statutes hath lost its effect: and writs of "quo warranto" (if brought at all) must now be prosecuted and determined before the king's justices at Westminster. And in case of judgment for the defendant, he shall have an allowance of his franchise; but in case of judgment for the king, for that the party is entitled to no such franchise, or hath diffused or abided it, the franchise is either feised into the king's hands, to be granted out again to whomever he shall please; or, if it be not such a franchise as may subsist in the hands of the crown, there is merely judgment of "ouster," to turn out the party who usurped it. Cro. Jac. 259. 1 Show. 280.

The judgment on a writ of "quo warranto" (being in the nature of a writ of right) is final and conclusive even against the crown. (1 Sidd. 86. 2 Show. 47. 12 Mod. 225.) This circumstance, together with the length of its process, probably occasioned that it difuse into which it is now fallen, and introduced a more modern method of prosecution, by information filed in the court of king's bench by the attorney general, in the nature of a writ of "quo warranto," in which the process is speedier, and the judgment not so difficult. This is properly a criminal method of prosecution, as well to punish the usurper by a fine for the usurpation of the franchise, as to out him, or lefe it for the crown; but hath long been applied to the mere purposes of trying the actual right, feizing the franchise, or outhing the wrongful possessor: the fine being nominal only. Blackit. Com. b. iii. See Information.

QUOD HOC, a term often used in law reports to signify, "as to the thing named" the law is fo, &c.

QUOCOLONOS, the name of the stone found in Tuscany, as hard as a flint, somewhat transparent, and, in some measure, resembling marble. In the fire it loses its transparency, and becomes less ponderous, and white; and a strong fire readily converts it into glass. It has no medicinal virtues, but is used at some glafs-houses.

QUOD, Cape, or Quado, a cape on the coast of Patagonia, in the straits of Magellan. S. lat. 53° 33'. W. long. 74° 6'.

Quod clerici beneficiati de cancellaria, in Law, a writ to exempt a clerk of the chancery from the contribution towards the proctors of the clergy in parliament. Rep. Orig. 261.

Quod clerici non elegantur in officio ballivi, &c. is a writ that lies for a clerk, who, by reason of some land he hath, is made, or like to be made, a bailiff, beadle, reeve, or such-like officer.

Quod sum, that whereas, being by way of recital, and not positively, is not good in indictments. 3 Salk. 188. See Indictment.

Quod ei defecaret, a writ for tenant in tail, tenant in dower, by the courtesy, or for term of life, having lost their lands by default, against him that recovers, or his heir. Reg. Orig. 171. Stat. Welfm. 2. cap. 4.

This, though not strictly a writ of right, so far partakes of the nature of one, as that it will relieve the right to him who has been thus unwarily deforced by his own default. (F.N.B. 155.) But in case the recovery were not had by his own default, but upon defence in the inferior polleffion action, this still remains final with regard to these particular offences, as at the common law: and hence it is, that a common recovery (on a writ of entry in the poff/) had, not by default of the tenant himself, but after his defence made, and voucher of a third person to warranty) by default of such voucher, is now the usual bar to cut off an estate-tail.

This writ may be brought against a stranger to the recovery: as, if a man recover by default, and maketh a feoffment, this writ may be had against the feoffor.

Quod medium. See Medium.

Quod permissat, in Law, a writ that lies where a man is dispossessed of his common of pasture, and the defier of aliens or dies feised, and his heir enters; then if the defier die, his heir shall have this writ. See Disturbance of Common.

Quod permissat proferenere. See Affife of Nusance.

Quod pernona nec probedari, &c. a writ that lies for spiritual persons, when disintrained in their spiritual polleffions, for the payment of a fifteenth, with the right of the parifh. F.N.B. 176.

QUODLIBETICAL Question, Questions quodlibetica, a college term for a thesis, or problem, anciently proposed to be debated in the schools, out of curiosity and entertainment, rather than for the settling of any useful point.
The term is formed from the Latin quodlibet, any thing, what you please: and so well satisfied were the public of the impertinences of these questions, that the term quodlibet has been since retained, to signify any little ridiculous quibble.

QUOJA, in Geography, a country of Africa, situated above 100 miles from the coast of the Atlantic, between the 8th and 10th degrees of W. longitude, and between the 7th and 9th degrees of N. latitude.

QUOIF, in Ship-Building, a piece of oak thickfluff on the deck-hook, to which the deck water-way on each side is butted, otherwise the butt would come in the middle, and could not be caulked.

QUOIL, or Cottle, in the Sea Language. A cable is said to be quoil’d, when it is laid round in a ring, one turn over another, on the deck of a ship.

The middle of such ring, or quoil, is a good place to lay shot in: they are more safe there, than in lockers along the side, where the enemy’s shot may fall into them.

QUOIU, Weather. See WEATHER QUOIU.

QUOIU, or Coin, formed from the French coin, of the Latin cuneus, wedge, a board a ship, is a wedge fastened on the deck, close to the breech of the carriage of a gun, to keep it firm up to the ship’s side, and prevent its rolling; and also to raise or depress it.

QUOINS, Cantic, are short three-legged quoins, put between casks to keep them steady. See Coin.

QUOINS, in Architecture, denote the corners of brick or stone walls.

The word is particularly used for the stones in the corners of brick buildings. When these stand out beyond the brick-work (their edges being chamfered off) they are called rustic quoins.

QUOIU, in Geography, a small island in the Indian sea, near the W. coast of Madagascar. S. lat. 14°. E. long. 45° 14′. Alto, an island in the East Indian sea, N. of the Nicobar islands. N. lat. 9° 56′. E. long. 93° 20′.

QUOITS, a kind of exercise or game, known among the ancients under the name of the discoil. See Disc.

QUOLL, in Zoology, a name given by the natives of New Holland to an animal resembling a pole-cat, with a brown back, spotted with white, and the belly of a pure white, in which it differs from others of these fœtid animals.

Cook’s Voy. 1770, vol. iii. p. 626.

QUONDANGA, in Geography, a town of the Birman empire; 32 miles N. of Prome.

QUORUM, a term frequently mentioned in our statutes, and often used in commissions, both of peace, and others. A justice of the quorum is thus called from the words in the commission, Quorum C. D. or A. B. aliquem vestrum unum effe volumus.

For an example: where a commission is directed to seven persons, or to any three of them, of which A. B. and C. D. are to be two; there A. B. and C. D. are said to be of the quorum, because the rest cannot proceed without them.

So a justice of the peace and quorum is one without whom the rest of the justices, in some cases, cannot proceed. See JUSTICES OF THE PEACE.

QUORUM Nominá. In the reign of king Henry VI. the king’s collectors, and other comptainers, were much perplexed in passing their accounts, by new extorted fees, and forced to procure a then late-invented writ of quorum nominal, for the allowance and suing out theirquietus, without the allowance of the king.

QUOTA, in Law, a tax to be levied in an equal manner.

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QUOTATION, in Literature, a citation; or a passage recharged expressly in one author from another.

Quotations are usually distinguished by inverted commas. The manner of quoting by book, and chapter, or section, is chiefly affected by men of erudition; but it is abused: this method ought only to obtain where the whole chapter or section is expressly on the subject. On other occasions, quoting by page is more commodious; except in classics, and other ancient writings, of which there are many editions in different forms; where this method is of little use, unless the edition be also specified.

The quotations from the Old Testament, found in the New, have occasioned great doubt, dispute, and criticism. The apolites are frequently referring to the Old Testament, and quoting passages and prophecies thence, as fulfilled in our Saviour; yet these passages, thus quoted, are frequently either not found in the Old Testament at all, or they are not urged in the New, according to the literal and obvious sense they seem to bear in the Old.

A late ingenious author, in an “Effay upon the Truth of the Christian Religion,” frankly owns, that the evangelists sometimes apply to the Messias passages of the Old Testament, which, as they lie in our present copies, plainly relate to some other person, or thing. This is evident, e. gr. in the passage, Matthew, ii. 15. Out of Egypt have I called my son; which is quoted from Hoftes, xi. where it is plainly understood of the coming of the Israelites out of Egypt.

This circumstance has been urged as a great objection to Chriftianity, which the divines, commentators, critics, &c. have long laboured to remove, though by very different means.

Some have recourse to a double completion; and imagine, that though the prophecies were primarily accomplished in other events, yet they might have a secondary accomplishment in the Messias: but others set aside a double completion, except where the prophet himself declares as much, this otherwise making all prophecy useless. See PROPHECY.

The generality chooses, therefore, to have recourse to an allegorical, typical, or spiritual meaning in the prophecies, &c. and suppose them to have been thus understood among the ancient Jews, thus fulfilled in our Saviour, and thus applied by the apostles.

In effect, the Jewish rabbins, it is allowed, took great liberty in quoting and interpreting scripture; and it is supposed the apostles might follow these rules in their quotations.

Accordingly, M. Surenhusius, Hebrew professor at Amsterdam, has endeavoured to retrieve these rules, long since lost, in an express treatise on this subject, published in 1713. This author observes a great deal of difference applied in the different forms of quoting used by the sacred writers; as, It has been said; it is written; that it might be fulfilled which was spoken by the prophet; or the Scripture says; see what is said; the Scripture foretelling; it is not written, &c. He adds that the books of the Old Testament have been divided in a different order at different times, and having had different names, it is thence, that one book or writer is sometimes confounded with another.

For the rules of quoting and interpreting practiced among the rabbins, he gives us ten; recovered with much difficulty from the Talmud, and the ancient Jewish doctors; instances of which he gives us in the writings of the apostles; and by those rules he endeavors to explain and justify all the quotations made from the Old Testament in the New.

The rules are, 1. Reading the words not according to
the points placed under them; but according to others sub-
stituted in their stead; as is done by St. Peter, Acts, iii. 23.
by Stephen, Acts, vii. 43. and by Paul, 1 Cor. xv. 54.
2 Cor. viii. 15, &c. The second is by changing the letters;
as is done by Paul, Rom. ix. 33. 1 Cor. xi. 6 Hebr. viii. 9.
and xi. 5. and by Stephen, Acts, vii. 43. The third is by
changing both letters and points; as is done by Paul, Acts.
xiii. 41. and 2 Cor. viii. 15. The fourth is by adding some
letters and taking away others. The fifth is by transposing
words and letters. The sixth is by dividing one word into
two. The seventh, adding other words to make the sentence
more clear. The eighth, changing the order of the words.
The ninth, changing the order of the words and adding
other words. Both of which are done by the apostles.
And lastly, changing the order of words, adding words,
and retrenching words; which is a method often used by St.
Paul.

Other authors, as bishop Kidder, M. le Clerc, Mr. Sykes,
&c. solve the difficulty another way. That final
form of quotation among the evangelists. "That it might
be fulfilled which was spoken by the prophets" according
to these authors, means no more than an accommodation
of the prophet's words to the context in hand.

The word ἐρμηνεύω, fulfilled, does not necessarily determine us
to such a sense, as if the evangelists designed to speak of a
prediction of future events accomplished; but may rarely
express an accommodation of borrowed words. In effect,
says bishop Kidder, a scripture may be said to be fulfilled
two ways: properly, as when that which was foretold comes
to pass; and improperly, by way of accommodation, as
when an event happens to any place or people like to what
drew happen some time before. And thus it is that St. Matthew
says, on occasion of the murder of the innocents, that "then
was fulfilled what was spoken by the prophet Jeremy, In
Rama was a voice heard," &c.

This interpretation is confirmed by M. le Clerc, who observes
that the Jews, in their language, used to say, that a
passage of scripture was fulfilled, as often as any thing
happened to which it might be applied; so that the evan-
elist Matthew, who was a Hebrew, and wrote, as is
commonly supposed, in that language, intended no more in
the passage just cited, but that a thing happened, to which
one might apply what Jeremy had formerly said on another
occasion.

Accordingly, says Mr. Sykes, the evangelists, in citing
that passage of Isaiah, Behold, a virgin shall be with child,
&c. only use it as words of that prophet remarkably agreeing
to the miraculous birth of Jesus, and not as a prophecy
of his birth.

It may be added that this way of speaking was not un-
known among the heathen writers. Thus in Ælian, Di-
genès Simopénis used continually to say of himself, that he
fulfilled and underwent all the cruelties of tragedy.

The difficulty stated in this article has been already the
subject of discussion under the terms ACCOMMODATION and
PROPHECY. Whilst it is allowed, that here; passages in the
New Testament, and also in the writings of the Christian
writers, are very different from the corresponding passages as
they now stand in the Hebrew text; and that some words are
introduced as quotations which are no where to be found:
those who urge the objection should be disposed to pay due
attention to the various modes of replying to it, which bibli-
cal critics have propounded. Some have supposed, with Whiston,
those early Christian writers quoted from the LXX;
others have alleged that they sometimes quoted from their
memory; and this, it is said, is the more probable, because
the same passage is quoted in some cases by different authors
in very different words, even where the sense agrees. It is
moreover alleged, that the sense of the passages supposed to
be lost is still to be found in the Old Testament, though the
words be not; such especially are Matt. ii. ult. and
John, vii. 38. But if it were granted, that some of the
verbs originally belonging to the Old Testament are lost,
or materially corrupted, no objection could be justly alleged
against the authenticity and divine authority of the faced
writings in general. As for the quotations that occur in
the New Testament, the most probable opinion is, that
some of them are made from the Greek version and some
from the Hebrew text. To those who affirm, that though
such quotations are made from the Greek version, where
that differs from the Hebrew, yet both the text and the
version are in such places always the same in sense, we reply
with Dr. Kennicott, that this is not the case: and he thinks,
that the only way of doing justice to our Saviour and his
apostles in their references to the Old Testament, is to say
that for whatever purpose such quotations were made (whether
by way of expressing prophecy, or only of allusion and ac-
companiment) they were always conformable to the true sense of
the Hebrew text. For whenever he says it was not possible
to conceive, how any speaker or writer could quote truly such
and such words, as (εἰς) from Moses or from Isaiah, when
the words quoted are not the words of Moses or Isaiah,
and do not express even the sense of Moses or Isaiah; but
are only taken from some version, which (upon the present
supposition) was no version at all in these instances, because
it did not agree here in sense with its original. The founda-
tion of this mistake, as this learned writer adds, is the notion
that has prevailed of the integrity of the modern Hebrew
text; for the writers who have held this to be per-
fekt, have never been able and never will be able to vindicate
the prophetical quotations. Passages quoted from the several
Jewish writers by inspired men must (he thinks) have been
quoted agreeably to the sense of the Hebrew text; but such
quotations do not agree in sense with the printed Hebrew
text. Therefore some alterations have happened, either in
the Greek text of the New Testament, or the Hebrew text
of the Old. Collins says that the Hebrew text has been
delivered down perfect, and therefore that the quotations
are either forged or falsified in the New Testament. To this
it is replied, that as it appears from a collation of the Greek
MSS. of the New Testament, that the words of the
quotations are not corrupted in the Greek text, so it ap-
ppears from a collation of the Hebrew MSS. that the
words have been corrupted in the Hebrew. And this is
an answer which should approve itself to all Christians. See
Kennicott's State of the Hebrew Text, vol. ii. p. 345-
347. &c.

Upon the whole we observe, that the writers of the New
Testament did not make it a constant rule to quote from the
Greek version, because there are many places where their
quotations differ from those where there is agreement with the Hebrew.
And as the quotations now agree with the Hebrew, fre-
cently in the express words, generally in the sense; so it
is most probable, that they always agreed at first, and that
where the Hebrew was expressed properly in the Greek
version, they used the words of that version; and where
the version was not proper, they translated for themselves.

With regard to Matt. ii. ult. the first of the passages
above cited, Dr. Doddridge (Fam. Expof. in loc.) observes,
that Nazareth was a little city on the confines of Zabulon
and Issachar; so contemptible among the Jews, that it
was a proverb among them. No good thing can be expected
from thence. Thus was fulfilled what was spoken in effect by
many of the prophets, "he shall be called a Nazarene;" i.e. he
shall
shall appear in mean and despicable circumstances, and be treated as the mark of public contempt and reproach. If this sense be not approved, Dr. Doddridge professes to acquiesce in Chryfotom's opinion, that the passage referred to is lost, avouching his dissatisfaction with other interpretations of this passage. The second passage, viz. John, vii. 38, our learned expositor thus explains. "He that believeth in me, as the scripture hath said, out of his belly shall flow rivers of living water, i. e. as the scripture has in many places said and promised, he shall receive those supplies in to great an abundance, that he shall not only be refreshed himself, but out of his belly, or from within him shall flow vital spirituals, and as it were rivers of living water for the refreshment and comfort of others." Chryfotom, and after him many other eminent writers, particularly Zegerus, and I. Capelius, refer the words "as the scripture hath said," to the former clause, and understand them, as if our Lord had said, "He that hath faith in me," which the scripture requires, and thus they avoid the difficulty, which arises from our not finding the following words in scripture. But Grotius, with whom Dr. Doddridge agrees, supposes, that here is a general reference to the several prophecies which refer to the effusion of the spirit by the Messiah, under the similitude of pouring out water. See Isaiah, lii. 15. xiv. 3. lviii. 11. Joel, ii. 28.

**QUOTIDIAN**, in Medicine, signifying literally daily, is applied to all interimmitting diseases, which return once in twenty-four hours. As the most remarkable of these is the ague, or intermittent fever of marshy countries; so the term quotidian signifies emphatically a quotidian ague. The paroxysm usually returns in the morning. See Ague.

**QUOTIDIAN, Double**, returns twice in twenty-four hours.

**QUOTIENT, Quotiens**, formed from the Latin quotiens, q. d. how often is such a number contained in such another, in Arithmetic, the number resulting from the division of a greater number by a smaller; and which shews how often the smaller is contained in the greater, or how oft the divisor is contained in the dividend.

In division, as the divisor is to the dividend, so is unity to the quotient. Thus the quotient of 12 divided by 3 is 4; which is thus disposed, 3) 12 (4 quotient.

**QUOVEDO**, in Geography, a town of Ifria; six miles E. of Capo d'Ifria.

**QUOUSQUE**: Execution with a Quousque. See Execution.

**QUOYL**: See Quoij.

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**R.**

A liquid consonant, and the seventeenth letter of the alphabet.

The grammarians hold it a semi-vowel; especially in the Greek, where, in common with the other vowels, it admits an aspirate, &c. though whether the aspirate should be founded before or after it, is some doubt. We find instances of each.

Thus *dein* the Latins wrote *redetis*; and *inde* the *Ætolians* wrote *inden*; and in English words derived from the Greek it is followed by an *h*, as *rhapsody*. The ancient Goths, and Teutones, Littleton observes, always prefixed *b* to *r*. See H.

The sound is formed by a guttural extrusion of the breath, vibrated through the mouth, with a fort of quivering motion of the tongue drawn from the teeth, with the tip a little elevated towards the palate.

In some words, as *Rome*, rape, and river, it has a rough sound; in others, as *hard*, card, regard, its sound is smooth. *R* at the end of many words is pronounced like a mute *r*, as in *theater*, *sepulcher*, and *massacre*. *Rh* is used in words derived from the Greeks, as *myrrh*, *rhenum*, and *rhyme*.

The Hebrews allow the *r*, or *z*, the privilege of a guttural; that is, they never double it, which yet is done by the Arabs, Greeks, and Latins, &c.

Periuss calls the *r*, *litera canina*, because the dogs seem to pronounce it in snarling; yet it should seem to have had a foother found among the Romans than among us, by its being frequently interposed to prevent the clashing of vowels; as in *rurus*, in *nurus* from *nus*, *musurus* from *musurus*; and this softness was such as frequently occasioned its being dropt as useless in writing. Thus for *Heracles* they frequently wrote *Thbas*, and even *Thbas*; and for *jurium* *jurius*; *profrus* *profrus*; *sujum*, *sujus*, *profrus*.

In effect, there was that agreement between the sound of the *s* and *r*, that as the Romans avoided the doubling of their consonants, it was no wonder they here dropped the *r* in such words; the *s* supplying the place of both. Hence too it came to pass, that what they at first pronounced *afa*, *afena*, *casmen*, was afterwards *ara*, *arena*, *cornm*; and those words named *Psasu* and *Valesii*, were afterwards called *furii* and *Valerii*. Cicero tells us, the *Papirii* were first called *Papirii*; and even fixes the time when the change was made, viz. in the year of Rome 415. Feustas adds, that *olea*, *pignora*, *plurima*, were anciently written *olia*, *pignoja*, *plisma*.

From the same softness of the sound of the *r*, it came to be used indifferently with the *l* in many words; e. g. *Latioris* and *Lateilis*, *Palitha* and *Parilia*, &c.

Though the *r* more frequently degenerated into *l* thus *remures* became changed into *lemures*; *interlego*, into *inlego* and *pellaco*; *frater* into *fratellus*, &c.; and the same is sometimes done between *n* and *r*, as *acrus*, and *ancus*, &c. In the notes of the ancients, *R.* or *RO* signified *Roma*; *R. C. Roma* civitas; *R. G. C. ret gerenda causa*; *R. F.* *vexa feuctum et diutum*; *R. G.* *regis filius*; *R. P.* *res publica* or *Romani principes*; and *R. R. R. F. F.* *res Romana non ferro*, *sane flamma*.

R was anciantly a numerul letter, signifying 80; according to the verse,

"O octoginta dabiti tibi R, siquis numerabit."
When a dash was added at top, as $\overline{R}$, it signified eighty thoufand.

The Greek $\gamma$, with a small mark over it, signified a hundred; with the fame mark under it, it denoted $1000 \times 100$; thus $\gamma$ signified $100,000$.

In the Hebrew numeration, $\gamma$ denoted 200; and with two horizontal points over it, $1000 \times 200$; thus $\gamma$ = 200,000.

R on the French coins, denotes their being struck at Orleans.

R, or R, in Medicinal Prescription, stands for recipes, tales.

RAA, in Geography, a town of Norway; 10 miles N.E. of Frederickfadt.

RAAB, Gy, or Javariti, a town and fortrefs of Hungary, situated in a pleafant level country, at the confluence of the Danube, the Raab, and Rabnitz, which furround it. Its houses are conftucted of stone, and their streets are large and bright. It is the fea of a bishop. Its fortifications conftitute feven bailions, and it has always a strong garrifon, provided with military fторes. The fortifications of the city and caftle are chiefly the works of the emperors Ferdinand I. and Maximilian II. In this place are feen some Roman antiquities; 56 miles S.E. of Vienna. N. lat. 47° 42'; E. long. 18° 45'.

RAAB, a river of Stiria, which rifes near mount Rettlein, and runs into the Danube, near Raab in Hungary.

RAAF, or RAFF, Anthony, in Biography, the moft exquisite and celebrated tenor singer of the last century, was born at Bonn in 1710. He was a scholar of Bernacchi, and equally admired for his talfe, expenditure, and style of finging, by the Italians and Germans. In 1729 his voice was fettled from a high treble to a fweet and ftrong tenor, sufficiently for him to perform a capital part in an opera at Naples. After finging in all the great cities of Italy, he returned to Germany, where he was courted and careful by all the princes of the empire. He was knighted by the elector of Bavaria, and appointed his chamber musician. In 1751 he performed again at Naples in Mettaltano's "Attilo Rigolo," with the Mingotti, and in the letters of Mettaltano of that period, we have the poet's opinion of his performance. (Men. of the Life and Writings of Mettaltano, vol. i. p. 403.) He performed in an opera composed by Chrifitian Bach at Mannheim in 1770, when the celebrated air "Non fo donde vieni" was in his part, and which was afterwards fungs on our opera stage with fuch effect by Cipriani. Raff was at Paris more than once; for in 1780, his 70th year, Laborde fungs of him with great regard. "This celebrated tenor has acquired great reputation, and though at prefent d'un certain age, he oblige us still to admire his talfe, and regret all that he has left." According to Gerber, Musical Lexicon, vol. ii. he fungs at Mannheim in 1783, and was living in 1792.

RAAGO, in Geography, a small island of Denmark, near the N. coast of the island of Lolland. N. lat. 54° 58'. E. long. 11° 14'.

RAAGAUR, a town of Hindooftan, in the county of Malwa, near the river Niommudge; 74 miles N.E. of Ouein. N. lat. 24° 21'. E. long. 76° 56'.

RAALBRANN, a town of Auffria; seven miles S.E. of Meiſau.

RAAN, a town of Auffria; four miles E.S.E. of Hooren.

RASAY, an island of the Hebrides, or Western Islands, Scotland, is situated between the main land and the Ifle of Skye, and is included within the parish of Portree and shire of Inverness. It is about fifteen miles in length, and from two to five in breadth. On all sides the caftle rises to a great height above the level of the fea; and on the caft side its afcent is peculiarly bold, and almost perpendicular. The interior is throughout its whole extent mountainous; and hence it better adapted for paffage than for tillage, but there are nevertheless several spots of very fertile and well cultivated land. The supply of free-tone is almost inexhaustible, and there is likewise plenty of lime-tone. Formerly there were in Raafay several ancient chapels, but these are now ruined and only used as places of burial. Here are likewise remains of two forts, the high which was fituated at the southern extremity of the ifland, and is called Dunn-Cam, as tradition records, from Camin, cousin to one of the ancient kings of Denmark. The other fort, called Callie-Brochin, is a well-known land-mark among sailors. The rock on which it is fituated is nearly round, covering an area of little more than seventy feet square; is forty feet high, except at the fpot where the fcarf leads up to it; and is fifty feet above the level of the fea at its base. The caftle is built of tone and lime, and seems to have been no lefs strongly fortified by art than by nature. It was anciently the chief seat of the lairds of Raafay. Now, however, the family residence is at Clachan, or Kirk-town, near the opposite extremity of the ifland. One of the old Highland alliances has continued for more than two hundred years, and is still fubfiding between Macleod of Raafay, and Macdonald of Skye, in confequence of which the survivor always inherits the arms of the deceafed; a natural memorial of military friendship. At the death of the late Sir James Macleod, his fword was delivered to James Macleod, esq., the prefent laird of Raafay. Dr. Johnston, in his Tour to the Hebrides, fpeaks in warm terms of the elegance and hospitality with which he was entertained by this truly respectable family. Carliſe's Topographical Dictionary of Scotland, 2 vols. 410. 1813. Pennant's Tour through Scotland, vol. ii.

RAASS, a town of the duchy of Stiria; five miles W. of Marburg.

RAASTORF, a town of Auffria; four miles N. of Entzertorff.

RAAT, a town of Hindooftan, in the county of Agra; 128 miles S.S.E. of Agra. N. lat. 25° 37'. E. long. 79° 58'.

RABAÇAL, a town of Portugal, in the province of Beira; 12 miles S. of Coimbra.

RABANUS, Maurus Magnentius, in Biography, a celebrated German prate in the ninth century, was born at Fulda in the year 785. He was educated partly at Fulda, and partly at Tours, under the famous Alcuin. In the latter situation he distinguished himself by an unwearying application to his studies, and his almost unequalled proficiency in all the learning of the times, both profane and sacred. Not long before the death of Alcuin he returned to Fulda, and embraced the religious profession in its abbey. In the year 810 he was placed at the head of a school belonging to the abbot Rattrarius, and the fame of his superior learning soon raised the seminary into great reputation, and filled it with pupils, many of whom were afterwards promoted to the highest ecclesiastical dignities, and proved the brightest ornaments of the age. In 815 he was ordained priest, and in 822 he was elected abbot of Fulda. About 830 he was, by his prudence and good conduct, the means of effecting a reconciliation between the emperor Lewis le Dechonnare and his foes. Shortly after this, Ebbo, archbishop of Rheims, who had been condemned for high treason, was committed to his custody. In 838, at the request of
of count Erldrid, he sent a colony of monks from Fulda, to occupy a monastery lately founded by him at Hirchau; and at the same time, in order that he might be enabled to pursue his studies with less interruption, he devolved upon another person the care of governing the abbey. In the following year the monks expelled him from his post, complaining, that in consequence of his devoting himself to his studies, the necessary affairs of the monastery were neglected, and its estates suffered to be much dilapidated. He now retired either to St. Peter's Mount, or, as others report, to an humble apartment in the outer court of the abbey, where he spent his time in devotion, the study of sacred literature, and the composition of his various writings, devoted to the repeated entreaties of the monks who exalted him to resume his authority. In 847 he was elected to the archbishopric of Mentz, and in the following year he summoned a council, in which he procured the condemnation of Godofchale, for maintaining the doctrine of St. Augustine respecting predestination and grace. Rabanus died in 856, at the age of 71. He is described by Dupin as "having excelled all his contemporaries in the learning of those times, in explaining the principles of the liberal arts and sciences, and the rules of grammar and rhetoric; in a readiness in collecting from the fathers of the church common places upon the sacred Scriptures; in allegorizing the historical parts of the Bible; in an exposition of the mystical reasons of the ceremonies; in a facility at turning prose into verse, and in the manner of reducing all common places in precepts and instructions." And Mohheim says "he is deservedly placed at the head of the Latin writers of this age; the force of his genius, the extent of his knowledge, and the multitude of productions that flowed from his pen, citherto to this distinguished rank, and render improper all comparison between him and his contemporaries." He was the great light of Germany and France, because from his fund of knowledge those nations derived principally their religious instructions. His writings were everywhere in the hands of the learned, and were held in so much veneration, that during four centuries, the most eminent Latin divines referred to them as authority in religious matters. His writings consist of Commentaries on the Scriptures; Homilies on the Epistles and Gospels; Scripture Allegories, and a great many theological and literary pieces. Of which the most considerable number were collected and published at Cologne in 1627, in six vols. folio. Some other pieces of this author, not to be found in that collection, may be found in Baluze's "Miscellanées," among Father Sirmond's publications, and in the eighth vol. of the Collect. Concil. Mohheim. Dupin.

RABASTENS, in Geography, a town of France, in the department of the Upper Pyrenees, and chief place of a canton, in the district of Tarbes; 10 miles N.N.E. of Tarbes. The place contains 7590, and the canton 7422 inhabitants, on a territory of 150 kilometres, in 25 communes.

Rabastens, or Rabastins, a town of France, in the department of the Tarn, and chief place of a canton, in the district of Gaillac; 21 miles S.S.W. of Alby. The place contains 6076, and the canton 8124 inhabitants, on a territory of 152½ kilometres, in five communes. The principal article of its trade is wine.

RABAT, a town of Africa, in the empire of Morocco, situated on the S. side of the river Sallee. Rabat had formerly, at intervals, a number of European factories; but the difficulty of navigating the river, the obstacles arising from the arbitrary power of the sovereign, and the disposition and prejudices of the Moors, have disgustet the Europeans. Nevertheless, Rabat is the most proper place for trade of any upon this coast, both for its vicinity to Europe, and the quantity of wool, leather, and wax, which it is capable of furnishing. From its central situation in the empire, it is also better adapted for the conveying the commodities imported to every part of the country; but a despotic government acknowledges no principle but the convenience of the moment; it commands, judges, and executes, without considering either cause or consequence. At Rabat, near the mouth of the river, are the ruins of a castle, built in the twelfth century by Jacob Almanzor, but entirely destroyed by the late emperor. The walls, which still remain, are near two miles round, and fortified by square towers. They enclose the castle, the town of Rabat, and a large space of ground where J. Almanzor built beautiful palaces, and laid out delightful gardens, watered by plentiful fountains, which he brought from the neighbouring springs. These walls, as well as the palace and the town, were built by Spanish slaves, whom he took prisoners in his first campaign. Within the same inclosure he also built a very large mosque, of which the ruins still remain. The roof was supported by 360 columns of rough marble. Near it was a handsome square tower, strongly built with stone, near 200 feet high, and called the tower of Hassan. From this tower might be had an extensive view over the sea, and ships may be discovered at a prodigious distance. This monument is in almost perfect preservation. There are some docks for building ships both at Salée and Rabat; but the difficulty of navigating the channel, and the probability that the sand will continue to accumulate, give ground for apprehending, that very soon, only vessels with oars will be able to enter the river. Chénier's Morocco, vol. i.

RABAT Affirmawan, a town of Peru, in Farilistan; 120 miles E. of Schiras.

RABAT Arood, a town of Peru, in the province of Kerman; 40 miles E. of Keluh.

RABAT el Cadu, a town of Peru, in the province of Kerman; 40 miles E. of Maltih.

RABAT Maalad, a town of Peru, in the province of Kerman; 60 miles N. of Kabi.

RABAT el Niffa, a town of Peru, in the province of Kerman; 60 miles N.E. of Maltih.

RABAT Shekarzian, a town of Peru, in the province of Chorasan; 260 miles N.E. of Iphahan.

RABATE, in Falconry. A hawk is sometimes said to rabate, when, by the motion of the hand of the bearer, the lure, call, &c. the leaves pursueth her prey, or quarry, and recovers the fitt.

RABATE, in Commerce. See REBATE.

RABBIA, in Ancient Geography, a town of Judea, which belonged to the tribe of Gad; situated upon the torrent of Jaba; it was besieged by Joab, after he had defeated the Ammonites. Here was seen the head of Og, king of Bashan, who alone remained of the race of giants. — Abo, a town of Paleline, in the tribe of Judah. See RABBAN.

RABBATH-AMMON, or PHILADELPHIA, a town of Asia, situated in the mountains of the southern part of Palestine; S.E. of Tiberias, and S. of Bethra.

RABBATH-VOAB, or AREOPOLIS, a town of Asia, situated at some distance to the east of the lake into which the river Jordan discharges itself.

RABBEN, in Geography, a small island in the gulf of Bothnia. N. lat. 63° 14'. E. long. 22° 14'.

RABBET, in Carpenter, is a deep groove or channel, cut in a piece of timber longitudinally, to receive the edge of a plank, or the ends of a number of planks, which are to be securely fastened in it. The depth of this channel
Thus over colleges, and a school, and it order have any equi-
acquired, whereas it used no and a denoted an. The word evidently appears to have been equivalent to the
term רַב, rab, among the Hebrews. Accordingly, he who is styled by Daniel, in the above cited passage, רַבְכָּה, is, in the name man-
ner, level with the side of the keel at the extremities of the vei\emis.

RABBET-Plane. See Plane.

RABBETING, the planing or cutting of channels, or
grooves, in boards.

RABBI, or RABBIN, a doctor of the Jewish law.
The word in its original, רַב, signifies master.
The words rabbi and rabbain have the same signification; yet
is there some difference in their use. When we speak abso-
lutely, and without applying the term to any proper name, we
say rabbain, not rabbi. Thus we say, it would be unjust to
attribute to the ancient rabbains all the notions of the modern
ones.

On the other hand, when we prefix the term to the proper
name of some Jewish doctor, we say rabbi, not rabbain; rabbi Salomon Jarchi is of this opinion.

Yet rabbi having no plural, we say, the rabbins Juda
Chiog, and Juda ben Chabin, are the authors of two ancient
Hebrew grammas.
The title rabbi is said to have been first assumed, as a
distinguishing title of honour, by men of learning, about
the time of the birth of Christ; though it had been anciently
given to several magistrates and officers of state, and to those
who were of superior rank and condition in life. See Esther,
The first Jewish rabbi said to have been distinguished with
any title of honour, was Simeon, the son of Hillel, who
succeeded his father as president of the faneredom; and his
title was that of rabbain. The later rabbins tell us, that this
title was conferred with much ceremony. When a person
had gone through the schools, and was thought worthy of
this degree, he was placed in a chair raised above the com-
pany; and then were delivered to him a key and a table-
book; the key as a symbol of the authority conferred on
him to communicate the knowledge he had acquired, which
key he wore as a badge of honour, and when he died, it
was buried with him; and the table-book was a symbol of
his diligence in his studies, and desire of farther improvement.
To these ceremonies were added the imposition of bands by
the delegates of the faneredom, and the proclamation of his
title. It has been disputed, chiefly between Vitringa and
Selden, whether our Lord had taken the degree and title of
rabbi in the Jewish schools; Vitringa maintains the affirmative,
and Selden the negative. See Jennings’s Jewish Ant. vol. i.
400. 8c.
The Jewish writers distinguish betwixt the titles rab, rabbi,
and rabbain.

In the Old Testament we find the term רַב, rab, in com-
position with some other words, employed as a name of
office and dignity, but not till the people became acquainted
with the Chaldeans, concerning whom only it is used. The
word, both in Hebrew and in Chaldee, signifies sometimes
great, sometimes many, and when used flippantly, denotes
one who is at the head of any businesses, of whatever kind it
be. Thus רַבְכָּה רַבְכָּה, rab butchkel, is, in the LXX, ἰερόπο-
κράτος ἱερόποκράτος, rab tecbchim, εἰς τὸν ἱερόποκράτος, chief cook. (Jonah, i. 6.
Jer. xxxix. 11, see also Dan. i. 3.) It is used in the plural
also for chief men in general, superintendents, or those at the
head of affairs. Thus רַבְכָּה רַבְכָּה, rab hamnuteb, are
the chief men employed by the king over the different de-
partments of the state. (Jer. xxxix. 13.) The original term
futs entirely the import of the Latin word princeps, but
not of the English word prince, at least in its most common ac-
cception; for they are not the king’s sons, or nobles of
any order, who are so denominated among the Chaldeans.
The word evidently appears to have been equivalent to the
term רַב, rab, among the Hebrews. Accordingly, he
who is styled by Daniel, in the above cited passage, רַבְכָּה, is, in the name man-
ner, level with the side of the keel at the extremities of the vei\emis.

Again, the word rab is sometimes found in that version,
combined not with the title of any fort of officer, but with
a term denoting the office or charge itself; in which case it
always means the person who is principally entrusted with
the business. Thus, rabbeith (Matt. xx. 8.) is the steward,
who is over the housefciid; and rab-congobetha (Mark, v. 35.)
is the ruler of the synagogue, εἰς τὸν ἱερόποκράτος. It is not unlikely, though no example occurs in scripture,
that the term has at first been similarly compounded with
some word signifying a school, or, perhaps, with the
name of the art or science taught, in order to denote the
overseer of such a seminary, or the teacher of such an art.
When the term rab came to be peculiarly applied, as an
honourable compellation of the learned, the word with
which it was, at first, for distinction’s sake, compounded,
would be superceded as unnecesary. It is, at least, certain,
that the Jewish doctors, who resided at Babylon about the
time of our Saviour, were called simply rab. But in the
Old Testament there is no trace of such a title as rab,
rabbi, or rabbain, given to a man of letters; nor is any one
of the old prophets, or scribes, or indeed any other peron,
distinguished by this mark of respect prefixed to his name.
Although the introduction of titles is always occasioned by
the creation of useful important offices, it is commonly in
the decline of merit that pompous titles are most affected.
At first, without doubt, vain-glory has led many to assume
them, to whom they did not belong, in right of office, and
an interested adulation has induced others to give them.
Some of them, however, came soon, among the Jews, to be
converted into a kind of academical distinctions, which, in
order to give them more weight, are said to have been con-
ferred solemnly in their schools or colleges, accompanied
with certain religious ceremonies. From this practice
sprung literary degrees in Christian universities, to which
there is nothing similar in all Pagan antiquity, either Greek
or Roman, but to which the Jewish custom above-mentioned
bears an evident and close analogy.

As for rab and rabbai, the only difference, it hath been
said, betwixt them is, that rab was the title of such as had
had their education, and taken their degree in some foreign
school, e. g. at Babylon; whereas rabbain was the title of such
as were educated in the land of Judea, and more honourable
than the other. But the highest and most honourable
title was rabbain; which they, say, was never conferred
on more than four persons; viz. on R. Simeon, one of
his
his descendants, and R. Jochanan, who was of a different family.

Those who belonged to the Jewish schools were divided into three classes or orders. The lowest was that of the disciples or learners; the second, that of the fellows, or companions, who, having made considerable progress in learning, were occasionally employed by the masters in teaching the young students; and the highest was that of the preceptors, or teachers, to whom they appropriated the respectful title of doctor, or rabbi, differing, as some have said, from rab only by the addition of the affix pronoun of the first person. This title rabbi was the highest academical honour. In the gospels, ἀναφέρεται is given as the Greek translation of the Syriac rabbi. (John, i. 38.) Yet this word does not, as the Greek, literally signify teacher; but, having been conferred at first, as a mark of respect on actual teachers, and afterwards on other learned men, was justly accounted as apposite a version as the Greek language afforded.

In process of time, the term rabbi was used with great latitude; being bestowed on those who were not actual teachers; and yet it always retained, ever since it had been appropriated to the learned, a relation to learning, and denoted that the person who enjoyed it, though not actually employed in teaching, was well qualified for the office. Rabban, as some have alleged, is not the name of a degree superior to rabbi, though it seems intended for heightening the signification, and may be understood to denote eminent or learned rabbi, but it was very seldom used. The title rabbanon, which we find to have been twice given to our Lord, (Mark, x. 51, John, xx. 16.) is rabban, with the addition of the affix of the first person, and accommodated to the pronunciation of Judea. The use of the term rabban does not seem to have extended far beyond Palestine, as we may conclude from the following circumstance. Although the word rabbi is very common in the Syriac translation, the Greek ἀναφέρεται being generally so rendered; yet in the only place where that translator introduces the word rabbanon, which is that quoted from John, where prefaces in Hebrew, that is, in the dialect of Palestine, which was then so called, adding the explanation given by the evangelist, that is, teacher; which plainly shows that the word rabbanon was not Syriac. This is the more remarkable, as in the other passage, where the historian interprets, in the same manner, the word rabbi, adding (John, i. 38.) "αὐτοὶ ἀναφέρεται σπουδοῦντες," that interpreter omits this explanatory clause as intended only for the Greek reader, and of no use to those who understand Syriac. In the passage in Mark, where rabbanon occurs, as the evangelist had added no explanation, his interpreter has not thought it necessary to change their own word rabbi; thus regarding the difference in signification between the two words as unimportant, to which we may add, that the apostle John explains both by the same Greek word. It may be here observed that it was customary to enhance the import of a title by doubling it. Thus our Lord, speaking of the Pharisees, says, (Matt. xxii. 7.) "they love to be called of men, rabbi, rabbi." In this manner he was himself addressed by Jews, at the time when that disciple chose to assume the appearance of more than ordinary regard. (Mark, xiv. 45.) The title rabbanon seems to have been used in the same manner. (Matt. vii. 21.) The words Jewish rabbi and Jewish doctor were commonly used synonymously. In Justin Martyr's dialogue with Trypho the Jew, the rabbies are always called ήλεγχοι. But some may object that this does not account for the application of the title to our Lord, as he did not derive his doctrine from any of those learned sennaries, frequented by men of the youth as were reckoned

the flower of the nation, the name doctor could not, with propriety, be applied to him. To this objection it may be replied, that as in Judea at that time they spoke not Greek, but a dialect of Chaldee, not differing considerably from that which is called Syriac, it is evident that the actual composition by which our Saviour was addressed, was rabbi, equivalent to the Greek ἀναφέρεται. Besides, though the title rabbi could regularly be conferred only by those who had the superintendency of their schools, yet the people would be disposed to give the composition through courtesy, and on the presumption that it had been conferred, wherever they saw or supposed distinguished abilities in teaching; and this probably was the reason why it was given to John the Baptist. (John, iii. 26.) Moreover, in the Jewish state, a divine commission was conceived to confer all sorts of dignities and honours, in an eminent manner, and thus superceded all ordinary rules and human distinctions. Accordingly, some of those who gave the title of rabbi to our Saviour, were willing, either sincerely or pretentiously, thus to account for their doing so. Thus Nicodemus affirms the reason why he saluted him rabbi (John, iii. 1. &c.), although he knew that he had not been educated in human literature, and had not received from man any literary honours. Upon the whole we may remark, that the term ἀναφέρεται may be fitly expressed, either by the English term doctor, or by the Syriac rabbi, which is now so much naturalized among us, that its meaning, as a Jewish title of literary honour, can hardly be mistaken. It must also be allowed, that the rabbi among the Jews of our Saviour's age, was a title in the highest degree respectful; and on that account it was interdicted by their master, even to the apostles themselves. Campbell's Seventh Preliminary Dissertation.

The modern rabbins are entitled to a considerable respect among the Jews: they have the first places in the synagogues; they determine all matters and controversies of religion, and very frequently pronounce upon civil affairs. They have even a power to excommunicate the disobedient.

They retain a vall number of superfluous traditions, from the writings of their predecessors; which they observe as scrupulously as they do the law of Moses.

The ancient rabbins were infinite dealers in allegories. Their writings are almost wholly allegorical, particularly their comments and interpretations of the scripture.

They had a great number of rules, and forms of interpreting and quoting, which some modern writers suppose to have been followed by the apostles, in their interpretation and quotation of the prophecies of the Old Testament, in the New. See Quotation.

Rabbinical Character. See Hebrew.

Rabbinical Hebrew. See Hebrew.

Rabbinist, a follower of the doctrine of the rabbis; a term used in contradistinction to Carait.

Father Simon contends for Rabbanis, or Rabbanites, instead of Rabbanis; in effect, the former readings are apparently preferable to the latter; the word being derived from the Hebrew Rabbanim, which is the name of the sect, and which the Jews use to distinguish their doctors from those of the Carait Jews.

Rabbinis, then, signifies a Jewish doctor who adheres to the traditions of his fathers; not simply a rabbin or doctor; for the Caraites, who oppose those traditions, have their rabbins as well as the other Jews.

Rabbit, Cuniculus, in Zoology, a well-known animal of the bare kind, or the lepus cuniculus of Linnaeus, with a short tail and naked ears. In the wild state the colour of the fur is brown; but in a tame state it varies to a black, pied,
pied, and quite white: the eyes are of a fine red. In their wild state they inhabit the temperate and hot parts of Europe, and the hottest parts of Asia and Africa. See *Lepus Cuniculus*.

The female, or doe rabbit, goes with young thirty days, and then the kindles; and if the doe not buck presently the lobs her month, or at least a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in some places much sooner; and they continue breeding very early in the year, from four to eight in a litter, and hence it is that a small number at first will soon flock a whole warren, if left to breed a little while undisturbed. The does cannot fickle their young till they have been at buck again; this therefore is not done prestantly, else there is a fortnight lost of the time for the next brood, and the present brood also probably lost. When the buck goes to the doe, he always first boats and flamps very hard with his feet, and when he has copulated with her, he falls backwards, and lies, as it were, in a trance; in this state it is easy to take him, but he soon recovers from it.

The buck-rabbits, like our boar-cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their licks, or nests, with gravel or earth, which they close so artifically up with the hind part of their bodies, that it is hard to find them out. They never fickle the young ones at any other time than early in the morning, and late at night; and always, for eight or ten days, close up the hole at the mouth of the nest, in this careful manner, when they go out. After this they begin to leave a small opening, which they increase by degrees, till it is large, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out; for they are at that time grown big enough to take care of themselves, and to feed on grafs.

People who keep rabbits tame for profit, breed them in hutches; but these must be kept very neat and clean, else they will be always subject to diseases. Care must be taken also to keep the bucks and does apart till the latter have just kindled; then they are to be turned to the bucks again, and to remain with them till they foon and run from them.

The general direction for the chooing of tame rabbits is, to pick the largest and fairest; but the breeder should remember, that the skins of the silver-haired ones fell better than any other. The food of the tame rabbits may be celer-roots and cabbage-leaves, carrots, parsneps, apple-rinds, green corn, and vetches, in the time of the year; also vine-leaves, grats, fruits, oats, and oatmeal, milk-thistles, four-thistles, and the like; but with these moist foods they must always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwise they will grow pot-bellied, and die. Bran and grains mixed together have been also found to be very good food. In winter they will eat hay, oats, and chaff; and these may be given three times a day: but when they eat green things, it must be observed, that they are not to drink at all, for it would throw them into a droopy. At all other times, a very little drink serves their turn, but that must always be fresh. When any green herbs or grafs are cut for their food, care must be taken that there is no hemlock among it; for though they will eat this greedily among other things, when offered to them, yet it is hidden poison to them.

Rabbits are subject to two principal infirmities. First, the rot, which is caused by the giving them too large a quantity of greens, or from the giving them fresh gathered, with the dew or rain hanging in drops upon them. It is excess of moisture that always causes this disease; the greens, therefore, are always to be given dry, and a sufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moisture of their juices.

On this account, the very best food that can be given them is dry hay and fresh thistle that can be got, of which one flack will serve two hundred couples a year; and out of this flock of two hundred, two hundred may be eaten in the family, two hundred fold to the markets, and a sufficient number kept in cage of accidents.

The other general disease of these creatures is a sort of madness: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This ditemper is suppos'd to be owing to the rankneas of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called turf-thistles, to eat.

The general computation of males and females is, that one buck rabbit will serve for nine does; some allow ten to one buck: but those who go beyond this always suffer for it in their breed.

The wild rabbits are to be taken either by small cur dogs, or by spaniels bred up to the sport; and the places of hunting those who escape from their burrows are under clofe hedges or bushes, or among corn-fields and fresh pastures. The owners use to confine them with small grey-hounds; and though they are seldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method of taking them is by nets, called purse-nets, and ferrets. The ferret is sent into the hole to force them out, and the purs-net being spread over the hole, takes them as they come out. The ferret's mouth must be muffled, and then the rabbit gets no harm. For the more certain taking of them, it may not be improper to pitch up a hay-net or two, at a small distance from the burrows that are intended to be hunted: thus very few of the number that are attempted will escape. The method by the dog, called the lurcher and the huffer, is also a very good one; and more.

Some, who have no ferrets, smock the rabbits out of their holes with burning brimstone and opium. This certainly brings them out into the nets, but then it is a very troublesome and offensive method, and is very detrimental to the place, as no rabbit will for a long time afterwards come near the burrows, which have been fumigated with these stinking ingredients.

The tefticles of a rabbit is a very good object for examining the structure of this part of generation in animals. The tefticles of various animals are very variously composed, but all, in general, of vesels variously rolled and folded together; and even the human tefticles are of the fame fort, being composed solely of rolls of vesels, without any intermediate substance, only confiting of vesels and their liquors. Phil. Trans. Ns 52.

The skins of rabbits are a great article of commerce, numbers being exported to China: the fur is of great use in the hat-manufactory.

*Rabbit*, in *Agriculture*, is sometimes employed as farming flock. It is sufficiently evident, however, that this is a description of farming flock that can only be attended to with advantage under particular favourable circumstances of soil and situation.

*Situation proper for Rabbits.—*The practice of forming rabbit warrens, can only be beneficially introduced where the lands are not capable of affording crops of tolerable grain or grafs. The great uncertainty of this sort of husband
hubbard renders it much more advantageous for the farmer to depend upon such crops, than on it. In hilly tracts of land, where the plough cannot be introduced, and where the soil is of such a light sandy porous nature, as to afford little or no grases for the paturage of sheep, or in rocky situations, this system of management may take place with profit to the farmer. And it has been observed by the author of the Rural Economy of Norfolk, that this sort of animal is there confined to the heaths, and the barren hills upon the coast. A level country is unfit for rabbit-warrens, but convenient for the plough; on the contrary, rabbits delight in the sides of sandy hills; which, where turn-wriff ploughs are not in use, are extremely inconvenient for tillage; and, when cultivated, are generally unproductive. For the rabbit, on level ground, finds it difficult to make its burrow; the excavated mould is all to be dragged upward to the surface; hence, a piece of ground altogether level, can seldom be stocked successively with rabbits; unless it be first laid up by art, at a great expense, into inequalities. While, on the contrary, against the side of a steep hill, the rabbit has no difficulty to encounter; the declivity affords him a ready vent for his mould; his work is all down hill; and, unless the soil be too stubborn, or too rocky, for the rabbits to work freely among, a broken hilly country may generally be stocked with advantage; provided a tolerable market for the carcasses can be had within reach. He thinks there are, perhaps, few sandy or other loose-foiled hills, which would not pay better in rabbit-warrens, than under any other course of husbandry that could be introduced on them. And it is afterwards flatted, in a minute, that on a considerable part of a farm which lies towards the coast, being hilly and very badly foiled,—more especially the tops and sides of the hills, which have always been full of rabbits in spite of all endeavours to destroy them,—the tenants last year (1782) applied for leave to convert this part, about ninety acres, into a rabbit-warren. Leave was given, and an allowance made them of half the estimated expense of raising a fold-wall fence round these ninety acres. He adds, that the fence was nearly finished, and the warren had, that year, turned beyond expectation; it was valued by one who ought to be the best judge of its worth, at forty pounds a year; which is nine shillings an acre. And that, as the part of a farm, these ninety acres were not worth five shillings an acre; at the then present price of barley, they were not worth more than four shillings an acre. It is, therefore, observed, that for ten pounds a real improvement of twenty pounds a year has been made and secured; for the warrenier will, through necessity, hereafter keep the fence in repair for his own advantage. He remarks, that the fence is made about four feet high, and three feet thick; faced with green-ward; and capped with furze, so as to project eight or ten inches over the face. Some of it was done for a shilling a rod; but the spring putting in, fourteen or fifteen pence a rod of seven yards was obliged to be given. And a neighbouring warrenier, that winter, gave nippers for the wall without the capping; which he does not mean to put on till the wall be thoroughly settled. This is very judicious; as several rods of that above-mentioned shot down in different places, as is often the case in such fort of work. It is further observed, that there are several patches in the valleys, and some on the tops of the hills which have usually been tilted. Some of these were last year (1781), and some of them ought to be every year, cultivated for the rabbits; thus, when the grases gets foul or mossy it should be ploughed up; fallowed, lowing turnip-feed for present feed, (they will not let rape get up,) and to prepare the foils for barley and grases-feed the ensuing year. Thus a regular succession of feedage might be kept up for the use of these animals. And in the Rural Economy of Yorkshire it is stated, that at Dalby there are two pretty large warrens. At Lockton there is one now (the time of writing) planting. And there are other parts of these heights which might be profitably stocked with rabbits. In general, however, property is too much intermixed to admit of an improvement, which isingularly adapted to the nature of these high grounds. And, that in situations where the ground, as well as the soil, is suitable to rabbit-warrens, and where an extent of it, sufficiently large, can be collected together in one property, there is a very strong reason why it may be profitably stocked with rabbits. It is added, that one of the warrens of this district contains eighteen hundred acres of surface; most of it covered with a black moorland soil; part of it a barren gravel; some little of it a thin lime-stone loam; not worth perhaps, on a par, for the common purposes of husbandry, a shilling an acre; nevertheless, these eighteen hundred acres are let, as a rabbit-warren, for three hundred pounds a year! He will not pretend to say, that this warren is worth three hundred pounds a year, nor affirm that it is not worth a shilling an acre to a husbandman. If it be worth two hundred and fifty pounds, as a warren, and supposing it to be worth even two shillings an acre, as a farm, it still is sufficient evidence of the profitableness of rabbit-warrens, in proper situations.

And in speaking of the wolds, he observes, that the warrens are numerous, and some of them very extensive. Coldham warren is at present, he believes, the largest upon the wolds; and, probably, the most valuable warren in the island. The Coldham farm contains about nineteen hundred acres; and, speaking generally, it is all warren; not, however, wholly appropriated to rabbits, a flock of from fix to eight hundred sheep being kept within the warren walls; principally, however, on one side of the warren, away from the burrowing grounds. And this appears to be a practice peculiar to the wolds of Yorkshire and Lincolnshire, whose hills likewise abound much with rabbit-warrens, and where better foil is appropriated to rabbit-warrens, than is perhaps in any other part of the island. The Coldham warren, in point of foil, is most of it worth from ten to twelve shillings an acre; some of it fifteen or sixteen shillings. But the present bleakness of the situation renders it of little more than half the value. As these better parts become mofly, they are inclosed by a fold-wall, the surface pared and burnt, and the foil broken up for arable crops. Having afforded a succession of crops of corn, turnips, &c. they are fown with grases-feeds, and again thrown open to the rabbits and sheep.

In 1783, there were about two hundred acres of this farm under the plough, besides some little sheep-walk which lay without the warren walls. The warren therefore, at that time, contained from fifteen to sixteen hundred acres; and, adjoining to Coldham, are two more considerable warrens; so that there are, perhaps, three or four thousand acres of tolerably good land, lying together, and appropriated principally to rabbits.

But it is remarked in respect to foil, that there is a disadvantage in stocking a rich foil with rabbits; a flux of grases, after a dry seasaon, is found to produce a fouling; which sometimes carries off great numbers. With regard to the burrows on the high wolds, they are mostly on the sides of hills; at Coldham, principally in one deep valley; whole sides are steep; giving the rabbits great freedom in working. The foil, in this case, is about eight or ten inches deep, under this a chalky rubble, of some inches thick, lying on a chalk-stone rock. The burrows are in the sub-foil.
RABBIT.

between the soil and the rock, and chiefly towards the tops of the hills. And thousands of days build their nests in the burrows, to the great annoyance of the rabbits. But at Drifflefield, near Driffle, where there are two large warrens, the surface is a dead flat; nevertheless, the warrens are well stocked and productive; a proof that a flat surface may, in some cases, be profitably stocked with rabbits. The soil, in that case, is a light sand or gravelly loam, which is very proper for the purpose to which it is applied.

In some of the richest districts, rabbits occupy the different sandy hills, and many of the rocky wales; but there is nothing of any great importance in the management of them. Both the grey and black forts prevail in some instances. The writer of the Sussex Report on Agriculture thinks, that this fort of rock is the nuisance of a county; it increases and flourishes in proportion to the size of the wales, and is, of course, productive in this country. From Horsham forest, Ahebown, and other parts, very considerable quantities of rabbits are sent to be disposed of in London.

In some of the midland counties they are found to be sufficiently abundant upon the sandy parts of wale lands; in inclosed level land, it is thought that they are no better than vermin, and that should the commons be properly generally inclosed, they must be in a great measure exterminated to make way for a better fort of rock; in inclosed land, they can only be kept with propriety, either in small warrens near the house, well fenced in, for family consumption; or on sandy or rocky precipices, impracticable to the plough, where they should also be fenced in. It is well known, that in the neighbourhood of commons abounding with them, great pains and expense are often used to fence the inclosed adjoining lands from their depredations. Rabbits are certainly a fort of rock unworthy of being cultivated, or bred in any considerable numbers, on inclosed and cultivated land; yet doubtless defering considerable attention on impracticable sandy or rocky reefs, which may at the same time be planted; and when properly fenced in, and thus stocked, such land seems in a fully of the highest improvement of which it is capable.

In Cheshire many doubts have been entertained as to the advantages of encouraging the breed of rabbits, and many farmers are so utterly averse to them, that they would with the whole race to be entirely exterminated. Where land is inclosed, and applied to arable purposes, it seems agreed that by the injury they do to the fences, by the interfering with the cultivated land, and by the destroying of its produce, they are much more detrimental than profitable. It is, however, thought to be a question for consideration, whether, if a portion of weak land, or dry heath land, was set apart for a rabbit-warren, well fenced, and kept difficult for this purpose; it might not, in some situations, be more profitably employed in this than in any other manner.

By fome it is supposed, that it may be occasionally necessary to refrain them, on account of their alluring succulence; but that to attempt to exterminate them, if it were possible, could not be polite or advisable, as they furnish food for foxes, which would otherwise prey on game and poultry.

This fort of rock is frequently met with in many other districts on tracts and spots of similar kinds of barren and uncultivable forts of land, and is probably the most convenient, appropriate, and beneficial description of any by which they can possibly be occupied and managed.

Stocking.—In the second of the above districts, it is stated, that in focking a warren, whether the surface be flat or hilly, artificial burrows are made, to reconcile the rabbits to the ground, and to preferve them from vermin, until they have time to make their own burrows. And that in making these burrows, an improvement has lately, it is observed, been hit upon. They are bored with an auger, of a diameter large enough to make a burrow of a sufficient width. In a level warren, these augers may, from time to time, be found useful in forming such holes. They, however, in most cases, are capable of making burrows for themselves without any difficulty.

But in regard to focking in Lincolnshire, according to the agricultural survey of that district, some of the warren lands are focked in the proportion of three couple only to the acre; while in others, it is in a considerably larger proportion. And one buck or male rabbit is said to be there sufficient for one hundred does, or females; but this is certainly a much larger proportion of the latter forts, than is allowed in most other districts. On the bold warrens of Yorkshire, according to Mr. Marshall, one male is considered as sufficient for only five or seven females. In the other cases, the nearer they can be brought to that proportion, the greater the flock of young ones that may be expected, it being the nature or economy of the males to destroy their young, especially when the proportional number is too great.

Fencing.—The fencing in these situations is not well enough camed with furze, or of late with fluff straw, forming a kind of thatch. And it is supposed, that reed would be found admirable in this intention. The warrens near Driffield are fenced with paling; an expensive fence in the out-let, and always under repairs. A brook, though ever so deep, is found to be insufficient as a fence against rabbits; one side of Drifflefield warren is bounded by a brook but it is nevertheless fenced with paling. When the rabbits can evade this, they readily swim the brook. The necessity of good fences is of course sufficiently evident in this view, as well as that of preventing them from the destruction of vermin, and birds of prey, such as eagles, kites, &c. which are taken in feel traps, placed on elevated mounds of earth, where they delight to sit. It is this kind of fencing and coping, or kidding the top, together with food in winter, nets, traps, and other things for taking them, with charcoal for drying the skins, warrens' men for killing and carrying, horses for carrying them to market, &c. which constitute the great expence of this fort of management.

Different Breeds.—There are many different breeds or varieties of these animals, but those that are employed as flocks for warrens are the common grey and silver-grey breeds: the former of which is found to be considerably more hardy and much better for the purposes of food; but the latter has greatly the advantage in the value of the skin. In the above warrens, till lately the common grey rabbit, probably the native wild rabbit of the island, was the only species. At present, the silver-haired rabbit is found the better, and has, within the few last years, been introduced into most warrens. The skin of the grey rabbit is cut; that is, the wool is pared off the pelt, as a material of hats; whereas, that of the silver-haired rabbit is dressed as fur; which, the writer understands, goes principally to the East Indies. The colour is a black ground, thickly interlaced with white hair. The skins of this variety fall for about a shilling a dozen more than those of the common fort; a sufficient inducement for propagating it in preference to the grey fort in most cases. If the white forts could be introduced they might be still more valuable.

Management, Expenses, Profits, &c.—This is a fort of flock that on the whole only requires a slight attention; it is, however, necessary to supply the rabbits with additional food in the winter season, when the weather is severe, such
and was much more productive than old warren land is found to be, as they breed much better on such new than on old land. Used to kill about 2000 couple; flock left about 700 couple. Sod banks that colt, thirty-five years ago, 11. 2d. a rood of seven yards, would now cost 2s.; furze faggots were 7s. a hundred, that is, 5s. for the furze, and 2s. kidning, now doubled. Banks will last about seven years, in a middling way; from three to twenty: want facing once in seven years, at half the first expense; want capping in three years with the furze. Laying on, or capping, 3d. a rood now. It was then reckoned that 250 acres would clear 300l., besides rent, which then was 1s. an acre. Fencing annually half a mile 800 yards 133 roods at 1s., 6l. 15s.; for facing furze, a kid will do a yard; 2s. 5d. killing, at a kid a yard, 4400 yards and kidds, at 15s. now, for 120 or 27l. 10s., or per annum 9l. 3s. 4d. add 6l. 15s., it is 15l. 16s. 4d. per annum. A warrener 33l., a cow, fuel, and house: in all 40l. Extra labour, killing 18s. a-week for sixteen weeks, 13l. 8s. Also for a month 18s. a-week, 3l. 12s.: in all 18l. Befides nets and thread, 12 at 60s. yards each; last fit or seven years; would cost 1l. 11s. 6d. Traps 5s. a-year. The men who kill will carry. Four horfes for six weeks, 1l. 4s. a-week, 7l. 4s. Charcoal for drying skins, 5s. A perfon to order skins, that is, clear from fat, and drying, five weeks; a useful woman will do it, 1l. Winter food (after three days now they must be ferved) cannot be less than 10l. a year on 250 acres.

RABBIT.

such as fine green hay, fainfain, clover, turnips, and others of the fame fort, which must be distributed over the warrens. It is fuppofed that turnips anfwer the beat in deep fnows, as the rabbits can difcover them by the fcent. This fort of food is given in the quantity of two or three large cartfuls to a thousand couple per day, and one load of hay in the fame time during a ftoam. It is likewife fometimes the practice to diftribute billets of new cut alth-boughs, gorfce or whins, and other fimilar woods in the warrens, the bark and other parts of which is eaten, by which the proportion of hay is leffened in a confiderable degree. In great fnows, it is neceffary to clear them away from the ditches or fences, to prevent the rabbits from getting over them.

It may be obferved, that the rabbit is a fort of flock that begins to breed at an early age, as at eight, ten, or twelve months, going only about thirty days with young, the young being a little more than three weeks old before they appear from the burrows, during which time they are fuccked twice in the day by the mother. It is therefore evident, that they may breed three or four times in the course of the year under good keep, as the does take buck almoft immediately after producing their young. In warrens that are inclofed, it is however faid, that they feldom breed more than two or three times in the year. The annual produce per acre, is moftly estimated at from three or four, to eight or ten couple, yielding a profit of from eight, ten, or even fifteen fhillings, where they are conducted under a good fystem of management. And the produce is, as has been feen, the largeft on new lands; however, much of the profit muft always depend on situation, fo 2s. to be near good markets.

These animals are in what is termed feanfom from the end of October to the beginning of January, in which period the fett skins are produced; of course a large proportion of them is killed in this short time. The farmer often fustains great lofs in what by the purchasers are called half skins, quarter skins, and rachis, fixteenth of which are only confidered as a whole skin. The rabbits are difpofed of by the hundred, fix fcore couple being confidered as an hundred.

The following ftatements are given in the Agricultural Survey of Lincolnshire, on this fort of management. On the authority of Mr. Chaplin, it is fated that on 1000 acres it is fair to kill 2000 couple, which are fold by the hundred, as above; which have fold at 10l. an average of ten years; last year 13l.; killing and looking after, 60l. for 1000 acres. And on the warrens between Gayton and Tathwell, sliver skins have been from 15s. even to 21s. a dozen; but the common grey rabbit is fo much hardier, that if a warren be focked with both, there will, in a few years, be nothing but greys. It is added, that from Louth to Caflor, 18 miles, 10 of them are warrens, chiefly fivers; rent 2s. to 3s. an acre. They plough a part every year for corn and turnips; and laying down again with feed, let down the fences for the rabbits to enter. Warrens are reckoned profitable, fo that some fortunes have been made on them. It is further fated, that in point of skins, tho' bred about May-day undergo no change from their white colour, but from a white rack become a whole skin; bred at Lady-day, become black; in June, white; in July, black; in November, white again: then in full feanfom, as the carcafses are alfo. The skins ought to have those colours on the inftide, whenfyed, or stripped off from the rabbits. The writer further fates, that from 250 acres of land, that were fainfain worn out, and planted with rabbits, the following was the account many years ago; but all prices, rent, &c. &c. are calculated at the present rates; and it is to be noted, that the ground being thus new to rabbits

**Recapitulation.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent now</td>
<td>£ 0 6. 0</td>
</tr>
<tr>
<td>Tithe</td>
<td></td>
</tr>
<tr>
<td>Rates</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td></td>
</tr>
<tr>
<td>Warrener</td>
<td></td>
</tr>
<tr>
<td>Extra labour</td>
<td></td>
</tr>
<tr>
<td>Nets, traps, and charcoal</td>
<td></td>
</tr>
<tr>
<td>Horfes</td>
<td></td>
</tr>
<tr>
<td>Winter food</td>
<td></td>
</tr>
<tr>
<td>Poison, powder, and fhot, and sundries</td>
<td></td>
</tr>
<tr>
<td>skins 1 s. each</td>
<td></td>
</tr>
</tbody>
</table>

| Total                                       | 184 11 10 |

**Produce.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 couple at 9d.</td>
<td></td>
</tr>
<tr>
<td>Skins 9d. to 1s. 3d. average 1s.</td>
<td></td>
</tr>
</tbody>
</table>

| Total                                       | 275  0  0 |

| Expenes                                     | 184 11 10 |

| Total                                       | 369 11 10 |

| Profit                                      | 90 8 2    |

But it is, notwithstanding this ftatement, fuggefled, that if he had a warren of his own, he would plough it up for corn, &c.; thinking tillage now more profitable than rabbits. And the author adds, that at Partney fair, meeting with Mr. Grant of Withgal, and discourseing with him upon warrens, he informed him that a common flock in winter was three couple per acre, and the produce five or fix couple
RABBIT.

That killing, carrying, &c. might amount to something more than 1s. an acre: the best silver furs, which will not do well in other counties, where they have been tried. He has now 1000 acres of warrens; and upon 1000 acres the flock is 2600, and kill 5000 couple annually.

New land is the most productive. On such a warren, the rabbits must have two loads of hay a day in a form, or two or three large waggon loads a day of turnips. The warren has 20l. a-year, and two cows; the killers 8s. or 9s. a-week, and board for ten weeks.

Silver skins now are 10s. a dozen; have been 14s. to 15s. Fences 60 a-year; no crops ones; no buildings. The immense occupation of Mr. Grant and his sons, being much the most considerable in the county, with the circumstance of making an ample fortune, made him desirous of tending it. He is added, that 20 years ago, Drifby had a warren of 12 or 1300 acres; and the rent of the farm including it, 300l. a-year, which rent has been doubled by ploughing.

And Mr. Kerstow observed, that the community received next to nothing from warrens; which is probably the case, as has been seen above, where the land is capable of being managed under the plough, or the system of grazes.

And the calculation of Mr. Parkin, of a warren of 700 acres under rabbits, in the same district, stands thus: rent 6s.; standing stock 200 couple of silver hair, valued to the incoming tenant at 2s. 6d. a couple ten years ago, and demanding a capital of 1400l.; and carefully typed to catch all extra bucks, so as to leave only one-fourth of the total number of bucks.

Produce 3000 couples for sale, worth, on an average of seven years past, 15l. a hundred

But as some arc greys, the price 10l.

Take the average of the two, that is, silver hair of the Wolds, and greys of Lincoln Heath, it will be on a medium

Or about 10s. 10d. an acre. And add to these, 550 sheep, kept by a course of tillage; that is, ploughing up 50 acres annually for paring and burning for turnips; then spring corn and feeds, which feeds sheep-fed one year, and thrown open to the rabbits: the sheep at 2d. per week for 25 weeks, will amount to 72l. 10s. This is inferior to the common produce of sheep; but the rabbits will demand hay, &c. to the amount of the difference; and also a team of horses must be kept for the cultivation of 100 acres of land, and carrying the rabbits to market. Hence,

The 50 acres of corn will be consumed by the horses, and master's and warreners's cows, &c.

Expences and Profits of a Rabbit Warren Farm.

<table>
<thead>
<tr>
<th>Dr.</th>
<th>£ s. d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>To rent 700 acres of land, 5s. per acre</td>
<td>175 0 0</td>
</tr>
<tr>
<td>To tithe, one-ninth</td>
<td>19 8 10</td>
</tr>
<tr>
<td>To town charges</td>
<td>21 17 4</td>
</tr>
<tr>
<td>To master and mistresses's board and clothing</td>
<td>52 0 0</td>
</tr>
<tr>
<td>To four children, 10l. per year</td>
<td>40 0 0</td>
</tr>
<tr>
<td>To four servants, 10l. ditto, viz. three men and one maid</td>
<td>40 0 0</td>
</tr>
<tr>
<td>To extra labourers, carpenters, and other workmen</td>
<td>30 0 0</td>
</tr>
<tr>
<td>Total housekeeping</td>
<td>162 0 0</td>
</tr>
</tbody>
</table>

To Husbandry.

A warreners, with houfe, and two cows | 26 0 0 |
| To three extra labourers, mowing corn and hay, repairing, fencing, affiting in killing rabbits, &c. | 72 0 0 |
| To blacksmith's bill | 15 0 0 |
| Carpenter's ditto | 22 0 0 |
| Extra turnip-hoeers and hay-makers in summner | 20 0 0 |
| **Total** | 155 0 0 |
| **533 6 2** |

It is noticed, that as the family is maintained out of the farm, the interest of the capital of about 1400l. is not charged, because the interest would be only 76l. per year, when they are maintained out of the farm, with a profit of 294l. 3s. 10d.
RABBIT.

will quite depopulate the warrens. A considerable expense also attends the necessity there is for night-watchers, to protect them from the infinitely worse vermin, the poachers. With him the silver-grey skins have been sold from 8½d. to 15d. and 16d. per skin: the last two years they have only brought from 10d. to 11d. per skin; but to obtain even these prices, they must be what is called full seafoned, whole skins, and of the choicest colours, with respect to which the fashion varies very greatly. The carcasses, of late years, have not averaged net into pocket more than 4d. per couple, after the expense of drying them, and by means of light diligence carts, having them carried to markets 30, and sometimes more than 60, miles to obtain even that sum. This inconvenience is occasioned partly by its being necessary to kill eight or ten parts of a year's slaughter in so short a time, as between the second week in November and Christmas, on account of their skins being then only in full prime, and as they are also very soon subject to become putrid, much more so than hares; and their being obliged to be packed close together, very greatly increases the mischief.

The estimate of the warren on the estate at Thoresbyway of 1700 acres, as given by the tenant Mr. Holdgate, with the silver fort of rabbits, is this:

<table>
<thead>
<tr>
<th></th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour, three regular warreners, with extra}</td>
<td>85</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>servants at killing}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fences</td>
<td>42</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Winter food</td>
<td>42</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Nets, traps, &amp;c. &amp;c.</td>
<td>14</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Delivery</td>
<td>21</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Rent is paid to be 7s. an acre</td>
<td>595</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The capital employed is that sum with the addition of stock paid for; suppose this at 595 to be about three couple an acre at 2s. 4d.

<table>
<thead>
<tr>
<th></th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on that sum one year at 5 per cent.</td>
<td>1395</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Annual Account</td>
<td>1465</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

Expenses as above | £ | s | d |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>800</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>69</td>
<td>15</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Produce 10,000 couple, at 2s. 4d.</td>
<td>1166</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Profit</td>
<td>296</td>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>

Or about 22d. per cent. (the 5 per cent. included) on capital employed. This the writer observes is very great, reckoned on the capital, but small reckoned by rent, as it amounts to only half a rent. But suppose the grovs produce of 1500, which he takes to be nearer the fact; then the account will stand thus:

<table>
<thead>
<tr>
<th></th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produce</td>
<td>1500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Expenses</td>
<td>870</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Profit</td>
<td>629</td>
<td>16</td>
<td>3</td>
</tr>
</tbody>
</table>

Or 45 per cent. on the capital.

But it is supposed that, in whatever way it is taken, it explains the reason of so many of these nuisances remaining. The investment of a small capital affords a profit or interest that nothing else will, and of course the proprietor will be sure never to convert them to better use. But, it is asked, what pays the public interest? Here are only 200l. expenses to 600l. rent, what is the population, the industry, the improvement! The landlord gets the lowest of rents, the tenant makes a good profit, they divide all, and the rest of the world is little or no better for them.

Rabbit-warrens are met with in most other districts of the kingdom, both towards the southern and northern parts of it; but more abundantly in those of the north. In the south they have in most places been got quit of from any tolerable fort of land which is capable of affording any other better kind of useful produce, but in some parts of the north they still occupy spaces of ground which are of a good quality, and which might be converted to better purposes with great advantage to the proprietors, as well as farmers. Warrens of this nature, in some cafes, in both these situations, however, still continue to be well flocked, and in the latter, are in particular instances of pretty considerable extents.

In Cheshire, the principal rabbit-warrens are on Delamere forest, though on several of the heaths and sand-hills these animals are frequently met with, but not in such numbers together as to constitute warrens.

In the north riding of Yorkshire, also, a few rabbit-warrens are met with on the detached moors, as well as on the skirts of the higher moors; but they are not so extensive as to make them an object of much attention. The kind of rabbits here are mostly the common grey, with the exception of the flock on a warren at Nappa, in Wenlove-dale, of about one hundred and fifty or two hundred acres, which consists of silver-greys, and is the only warren which is known, in this district, to be entirely flocked with this sort: they are flat to have been brought some years since from a warren in the above noticed district of Lincolnshire, to which they had been originally introduced from Ireland. The skins of this kind of rabbits are supposed to be worth double those of the grey; they are not used for felts, as the last, but dressed as furs, and ultimately exported in that state for the China market, where they are worn by the principal people; an use which has been already noticed and confirmed in regard to the demand which it creates.

But in the northern parts of Lancashire, warrens of this kind are more frequent. At Rosscarroll-hall, in the tract called the Fild, one of great extent has existed for a very great length of time; but the present proprietor, B. F. Halkett, esq., has, with great propriety, lately reduced it very considerably, by taking two large fine farms from it, so that it now consists only of about a hundred acres of the most sandy barren part.

This warren formerly supplied a great number of rabbits for sale in the markets and hat manufactories of the neighbourhood, and of course became a source of profit to the owner, though the management was very imperfect. The farms taken from it will, however, become far more advantageous to him.

The flock here was formerly of the grey rabbit kind, and it is still the same on the warren which remains, which is however far from being sufficiently flocked.

There was formerly no fort of green food ever cultivated for this fort of flock; nor has it been yet attempted on the present warren, but the proprietor intends to have it done in an effectual manner. Nor have the rabbits ever been fed in the winter seafon with either hay, bark, or any other fort of
of food; their being so near to the sea-coast perhaps renders it unnecessary.

The only mode of taking the rabbits here has hitherto been in nets, by what is termed running them by means of dogs.

At Heylam, the Rev. Mr. Clarkson has a tract of coarse flatory land above his house, of about twenty acres, which has a great number of grey rabbits in it, and is well suited for a rabbit-warren, as it is incapable of being converted to any better purpose on account of the frequency of the west winds, and the effects of the sea-spray thrown up by them, as well as its rocky, winny nature.

The principal rabbit-warrens in this county are, however, those in the sandy tracts in the south and north ends of the isle of Walton, and in the neck of land from which it seems to have been separated. The rabbit-warren at the north end of this little island occupies a considerable space of ground of this barren sandy quality, as well as that at the southern point. The former is stocked wholly with rabbits of the grey kind, this fort being in great demand. There is much expense attending these warrens in many cases.

The expense of stocking in order to keep them up is sometimes very considerable. In this instance the farmer has upwards of two miles of dike fence composed of sod and flone to keep up and in repair, which costs from five to ten shillings the rod of seven yards. The expense of a man constantly to look after the rabbits, and keep the dike fences in proper order and repair. That of the purchase of the traps or types, which cost 57. a-piece, and eighteen are required; but they last long, and cost little in repairs.

The providing net and dogs, which is annually about 10L.

The charge of taking the rabbits at Uverton, twice in the week, during ten weeks, which is 5L. each time.

The sale of rabbits is annually from one hundred and fifty couple upwards, at the rate of 2L. 6d. each couple. They are usually sold to Lyons of Preston, who takes the charge of them after they have been delivered at the above-named place.

Not any sort of dry or green food is ever given to the rabbits in this warren during the winter season; but there is not any snow, and very little frost taking place; in consequence of the situation being surrounded by the sea.

The warren at the south end of the same little island is of similar extent, and exactly under the same fort of management; but it is said to be earlier, by a month at least, in the breeding of the rabbits, and the quality of their fur; which is supposed to arise from its being more fully exposed to the influence of the morning sun, in which the rabbit delights, and by which it is greatly benefited.

The rabbits are here likewise affected to fall for a higher price, as 5L. the couple, than in the warren at the north end of it.

The rabbit-warren at Sand-scale is another farm of this fort in this neighbourhood, under similar regulations, but somewhat smaller than those in the isle of Walton; and there is a hill smaller one attached to a farm at Roanhead, the property of Miles Sandyes, esq. of Graythwaite, which is conducted in much the same manner, and with the same results as in the above case.

It may be noticed that this fort of flock is mostly taken by nets or traps, set in the form of a fold between the places where they run, and those where they feed, the rabbits being hunted into them as they return from feeding. But the wold warrens, Mr. Marshall says, have three ways of catching their rabbits: with fold-nets, with snares, and with "types," a species of trap. The fold-nets are set about midnight, between the burrows and the feeding-grounds; the rabbits being driven in with dogs, and kept inclosed in the fold until morning. But the spring-net, when used, is, he believes, generally laid round a hay-field, or other place, where rabbits collect in numbers. It is added that the trap is a more modern invention. It consists of a large pit or cistern, formed within the ground, and covered in with a floor: or with one large falling door, having a small trap-door towards its centre, into which the rabbits are led by a narrow muce. And this trap, on its first introduction, was set more by a hay-field; hay being, at that time, the chief winter food of rabbits; or on the outside of the warren wall, where rabbits were observed to scratch much, in order to make their escape. Since the cultivation of turnips, as a winter food for this species of flock, has become a practice, the situation of the trap has been changed. Traps being cultivated in an inclosure within the warren, a trap is placed within the wall of this inclosure. For a night or two, the muce is left open, and the trap kept covered (with a board or triangular rail), in order to give the rabbits the requisite haut of the turnips: which having got, the trap is barred, and the required number taken. He adds, that in emptying the cistern, the rabbits are forced; those which are fat, and in season, are slaughtered; those which are lean, or out of condition, are turned upon the turnips to improve. And that, at the close of the season, the buck and doves are forced, in a similar way; the bucks are slaughtered, the doves turned loose to breed. Mr. Marshall also remarks, that great caution is requisite in the use of these traps. If too many rabbits be admitted at once, and the cistern be kept closed only for a few hours, the birds and inordinate heat takes place, and the carcasses, at least, are spoiled. Many thousand carcasses have been wasted through this means. The traps are therefore watched; and when the required number is caught, the muce is stopped, or the trap covered in a proper manner.

There is often much inconvenience in this fort of flock, from their getting out of their inclosures, and destroying the young corn-crops, new sown grasses, young turnips, and the quick hedges as well as young plantations of apple-trees that may be in the neighbourhood. This forms a material objection to this fort of flock by the farmer.

Tame Rabbits.—In respect to breeding and rearing tame rabbits with the view of profit, those who are engaged in the business perform it in hutchies, which must be kept very neat and clean, otherwise the rabbits will be subject to disease. Care must be taken also to keep the buck and does apart, till the latter have just killed, then they are to be turned to the bucks again, and remain with them till they run and run from them.

And the general rule for the shooving of tame rabbits, is to pick the largest and fittest: but the breeder should remember, that the flocks of the silver-haired and white furs fettle better than any other. The food of the tame rabbits may be calewort and cabbage-leaves, carrots, parsnips, green corn, and vetches, in the time of year; also parsley, grasses, green leaves, milk, and low-thistles, and other similar plants, but with these mossy foods they must constantly have a proportionable quantity of dry food, as hay, bread, oats, bran, and other similar matters, otherwise they grow pot-bellied, and die. Bran and grain mixed together have been found to
RABBIT.

to be very good food. In winter they eat hay, oats, and chaff, and these may be given them three times a day; but when they eat green things, it must be observed that they are not to drink at all, as it throws them into a dropdy. At all other times a little drink serves, but it should always be fresh. When any green herbs or grasses are cut for their food, ears must be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, it is a sudden poison to them. In this mode of breeding, one male to eight or ten females is sufficient.

It is remarked, that the author of the Treatise on Agriculture and Gardening, has bred these animals with much success and ornamental effect in a small artificial warren, in a lawn in the garden, made in the following manner.

"Pare off the turf of a circle, about forty feet diameter, and lay it on the outside; then dig a ditch within this circle, the outside perpendicular, the inner sloping, and throw earth sufficient into the middle to form a little hill, two or three feet higher than the level of the lawn; the rest must be carried away. Then lay down the turf on the hill, and beat it well to settle. The ditch at bottom should be about three feet wide, and three and a half deep, with two or three drains at the bottom, covered with an iron grate, or a fence with holes, to carry off the hay-stains in order to keep the rabbits dry. In the outside bank should be fixed alive, the fides and top supported, either by boards or brick-work, to give the rabbits their dry food in; by their different situations, some will always be dry, set boxes, or old tea-chiefs, let into the bank, will do very well. If the ground be very light, the outside circle should have a wall built round it, or some flaves driven into the ground, and boards or hurdles nailed to them, within a foot of the bottom, to prevent the bank from falling in. The entrance must be either by a board to turn occasionally across the ditch, or by a ladder. The turf being settled, and the grasses beginning to grow, turn in the rabbits, and they will immediately go to work to make themselves burrows in the fides, and in the hill. By way of inducing them rather to build in the fides, to keep the turf the nearer, make a score of holes about a foot deep, and they will finish them to their own mind; and if there be a brick-wall round it, it should be built on pillars, with an arch from each, to leave a vacancy for a burrow." But there is, he says, another way that may be practised, which is, "to dig the ditch only about two feet deep, which will yield about earth enough to make the hill; put some pales, about a foot high, on the outside, for that will be a sufficient height to keep the rabbits in. Feed them as other tame rabbits are fed; and in wet weather sprinkle sawdust at the bottom, by which means the quantity of manure will be increased; once a week is often enough to take it away: the quantity will be surprising, nor will the smell be in the least offensive, even though it be quite close to the house. In a very large lawn, two or three of these hills, with the rabbits feeding on the tops, will not be unpleasing objects. If the bucks happen to be mischievous in killing the young ones, they must be chained in an alcove; or else have their liberty as in a warren. After a great snow they will want some affillity early next morning; because the ditch will be nearly filled, and perhaps the alcove, where the hay is, will be blocked up."

He adds, that "it is a great improvement to cultivate the young bucks, and keep them till they are full grown, before you kill them; the flesh will be amazingly finer, whiter, and tenderer. But then it will be best to take them away, and keep them in another warren, left they should be too numerous, and disturb the breeding does; or else have a few hutchies in the alcove to fatten them in."

It is suggested, that "as oil-cakes are found of great use in fattening cattle, it is probable they would be useful in fattening rabbits: and it is ascertained, that some of the oil mixed with the pollard or buck-wheat, is cheaper than the cakes; but having never made the experiment, he cannot ascertait its superior advantages."

In this mode, attention should be had to the breeding that all of rabbits whole skins are in the greatest esteem with the furriers and hatters. These skins are generally of more value than the flesh, especially in the winter, against which time contrive to have the greatest quantity of these fattened bucks.

Profes.—It is remarked, in respect to profit in this way, that where does are kept in hutchies, they are supposed to breed six times a-year, and only five young ones are left to each, which is thirty from each doe; but as these are in a more natural way, and the young ones difficult to be gotten at, let us suppose about thirty-six to be produced from each doe, reckoning only seven-pence for each; there is a guinea profit from each doe; as the additional value of the skins in winter, and the dung, will more than pay the expense of food and attendance on them. And it is quite necessary that those who keep many rabbits in this way, should cultivate some lucern, parsley, and carrots, as no other vegetables are such proper food for them as these; they should also be fed upon some of the best upland pasture-hay; for if it be coarse, so far from eating, they will waste it. Lucern hay is very proper for them in these cafes.

In some districts very considerable profits and advantages are derived from the breeding and keeping of white tame rabbits. The skins of this fort having lately been much employed in trimmings, have sold at a much higher price than those of the common kinds. Their dung is also found of very great utility in the cultivation of large farms.

Difficult.—When kept in this way, rabbits are subject to several diseases, as the rot, which is caused by the giving them too large a quantity of green food, or the giving it fresh gathered, with the dew or rain hanging in drops upon it, as it is over-moisture that always causes the disease; the green food should, therefore, always be given dry, and a sufficient quantity of hay, or other dry food, in combination with it, to counteract the bad effects of it. And a fort of madness often seizes them: this may be known by their tumbling about; their heels upwards, and hopping in an odd manner into the boxes. This dillemer is supposed to be owing to the rankness of their feeding; and the general cure is the keeping them low, and giving them the prickly herb called tare-thistle to eat as much as possible. They are also subject to a fort of scabby eruption, which is seldom removed. These should, however, be distinctly separated from the rest of the flock.

It is noticed that the profit in this mode of management cannot, however, be well ascertained, as much will depend on the care which is taken in the feeding, and other management.

RABBIT-WARREN, the place where these animals breed and rear their young. The land for this purpose should be of a light sandy quality, and it is best to have a hilly situation, with a sunny exposure, being well inclosed by means of old-walls, or palings-fences: any fort of waste, craggy, or rocky land, on which nothing else can be cultivated, answers very well for this purpose. See RABBIT.
Rabbit—Warren Farm, that sort which is chiefly managed under the rabbit system. These sorts of farms are now much less common than formerly, but in some instances, as has been seen, they afford the best and most advantageous means by which lands can be turned to any account in the way of cultivation. They, however, in most cases require no little capital, exertion, and attention, to manage them in the best and most profitable methods. See Rabbit.

Rabbit Manure, that which is collected from the dung of these animals, and which is said to be very valuable. See Manure.

It is found beneficial in different modes of application, as by being intimately mixed and blended with the main particles of the soil or mould in arable lands, and by being thrown on the surface of it, in the way of a top-dressing, when they are in a state of crop. When used in this last manner, it is likewise highly advantageous on most sorts of grass land; and in both these cases of top-dressing with it, there is a very quick and powerful state of vegetation produced in the crops, which can hardly be gained in any other way. See Quick Manure, and Top-Dressing.

In Oxfordshire, Mr. Fane has raised a small building for keeping rabbits in hutch, for the sake of the manure; he is said to have some hundreds, and to meditate the erection of a second building for keeping double the number; the present quantity make a load of manure in the course of the week; and as two loads manure an acre, they are the means of fully dressing twenty-six acres annually; it is not conceived by them that they produce any other profit, nor is it necessary; for to be able to fell so much food at home, and to pay attendance, the profit of manuring such a breadth of land, it is supposed, must be considerable. Three dozen of rabbits in the week are mostly sent to the London market during the season in which they can be used.

This is a sort of dung or manure, which has yet been but little subjected to chemical examination, consequently its real properties, or constituent principles, are very imperfectly known or understood; it would appear, however, from the effects which it produces, that it may be employed with the most advantage, when laid upon the land, in its more raw, crude, or fresh state, before it has undergone much decomposition by the processes of fermentation or putrefaction. It has, perhaps, never yet been kept dry and reduced into a powdery condition, so as to be put in along with the seed, in the manner of rape-dill, though it seems probable that it would go farther, and be more beneficial, in some cases, if used in this way. See Dung.

Rabchorcado, in Ornithology, the name of an American bird, described by Nieremberg with many fantastic circumstances. All that seems certainly known is, that its tail is very remarkably forked.

Rabda, in Geography, a town of Arabia, in the province of Yemen; 30 miles N.W. of Sana.

Rabdiun, in Ancient Geography, Tur-Rabidin, a town of Asia, upon a mountain, at some distance from the Tigris, south of Tygrancocerta, and east of Nisibis.

Rabdoides. See Rabdoides.

Rabdoglogy, see Rabdology.

Rabdomancy, see Rabdomancy.

Rabebola, a name given by some to the roots of the flaminula major.

Rabela, Francis, in Biography, was born about the end of the fifteenth century at Chinn, in Touraine. At an early period he entered himself among the Cordeliers, and became well skilled in the learned languages, and the literature of the age. He acquired a good share of popularity as a preacher; and what he gained by his sermons, he expended in the purchase of a small library. His private life was not so exemplary as his public discourses were edifying; and for some misconduct, which caused scandal in the monastery, he was imprisoned in his cloister. By his wit and facetiousness he obtained his liberation, with the pope's permission to quit his order, and remove to that of St. Benedict. Not being able, however, to bear any kind of restraint, he laid aside his religious habits, and, in 1530, went to Montpelier to study medicine. After some time he repaired to Lyons, where he printed a collection of pieces of Hippocrates and Galen. Here he likewise published several other works, among which were some of the books of his History of Pantagruel, which gave him a distinguished place among burlesque writers. In 1535 he went to Paris, and waited on cardinal John du Bellay, to whom he had been known when they resided in the same convent; and he now made himself so agreeable to his old friend, that he was taken into his house in the several capacities of physician, reader, librarian, and steward. Du Bellay, in the following year, going out as ambassador to the court of Rome, took Rabelais with him, where his wit so much interested the pope and cardinals, that he very readily obtained a full abjuration for the crime of sacrilege. In 1537 he took his doctor's degree in physic at Montpelier; and returning to Paris soon after, his friend the cardinal presented him with a prebend in the chapter of St. Maur. He was afterwards made the curé of Meudon, which office he held from 1545 to his death, in 1553, being, according to one of his biographers, in the 62d, and according to another, in the 70th year of his age. His Pantagruel, which was finished about the time that he accepted the cure of Meudon, brought upon him the hostility of the monks, whom he had severely fatigued, and who procured its condemnation by the Sorbonne and the parliament; but it caused his company to be much sought after, as the wittiest writer of his time. The want of decency was easily pardoned at that period, and Rabelais had some estimable qualities, and possessed extensive and various erudition, with a ready eloquence, and an inexhaustible store of ludicrous ideas. "The Pantagruel and Gargantua of Rabelais," says a critic, "are to be regarded as comic fables, often concealing, under a whimsical extravagance, attacks upon follies which it would not have been safe seriously to expose. It is in vain, however, that commentators attempted to find out the meaning in much that is mere ribaldry and nonsense, and even to discover real history veiled in the allegory of burlesque, where the author meant nothing more than to make his reader laugh or wonder. His satire, where it is intelligible, is often just and ingenious; but the obscurity of his language, and eccentricity of his conceptions, render the perusal of his works, to a modern at least, rather a task than an amusement." The most complete editions of his works is that published in Holland, in 5 vols. 8vo., 1715, with notes by Duchat; and that at Amsterdam, in 3 vols. 4to., 1741, with plates by Picart. The letters of Rabelais were published in an octavo volume, with notes by St. Martin. The memory of Rabelais is perpetuated in the medical school of Montpelier, where men are invested with a scarlet robe, said to have been the very robe which that wit himself wore.

Rabelhorst, in Geography, a town of the duchy of Holstein; 5 miles W.N.W. of Cifmar.

Rabenau, a town of Saxony, in the margraviate of Meissen;
RABNECK, a town of Bavaria, in the bishopric of Bamberg; 3 miles S.W. of Weissenfeld.

RABERNE, Theophilus William, in Biography, a celebrated German writer, was the son of an advocate at Leipzig, and born at Wachau in 1714. He was educated at home, by tutors employed for the purpose; but when he was 14 years of age, he was sent to the college of Meifen, where he had for fellow-students Graber, Gartner, and Gellert, with whom, and particularly with the last, he formed a friendship which continued through life. In 1735 he went to the university of Leipzig, where he applied himself chiefly to the study of juriprudence, without entirely neglecting the Muses. In 1741, professor Schwabe having begun a journal in the German language, entitled "Amusements of Reason and Wit," Rabener became one of his principal coadjutors, and continued to assist him in his contributions till the year 1744. He is chiefly known as a writer in the first volume, by a humorous piece entitled "Proofs of the Necessity of employing Rhyme in German Poetry." This periodical work was, for some time, carried on with spirit and success; but at length it became degraded by literary disputes, which finally put an end to it; and another was established, under the title of "Contributions of Bremen." The writers engaged in this work were all the most celebrated persons who flourished at that period, among whom were Gartner, Schmidt, and Rabener, to whom were united Gellert, Klopotock, and others. The Journal of Bremen forms an epoch in the history of the German literature, as it introduced into the country a better taste, and tended greatly to improve the language, which, previously to this, had been much neglected. Rabener had before this been appointed controller of the taxes in the circle of Leipzig, a place of great labour, and which required an exact knowledge of the laws of the country, and the most inflexible integrity. Notwithstanding, however, the attention which the duties of this office required, he found leisure to continue his literary pursuits; and towards the end of 1751, composed his fortior letters, in which he introduces perorations of every latitude and character, all of whom speak in the language suited to their condition. In 1753 he was appointed chief secretary to the directors of the taxes at Dresden; and two years afterwards he published the fourth and last volume of his fatres, which contains "A Burlesque Explanation of the Proverbs of Sancho Panza," the "Jest of April," and "The Exchange and Reparation." After this he began to write for the stage, and composed a comedy in four acts, entitled "The Free-thinker," which, with many other papers and letters, were burnt, together with his house, during the siege of Dresden, in 1760. He now abandoned his literary labours, but his friends obtained from him a collection of letters, which were afterwards published by Wels. These were never intended for the public, but they are written with so much truth and sincerity, and exhibit a more correct picture of the author than any pen could have drawn. His health began to decline soon after his loss in 1750, and in 1765 he experienced a paralytic stroke, which was repeated in 1769; but he lingered out till March 1771, when he died. "He was," says his biographer, "among the small number of those privileged men, whom nature has endowed with every quality necessary to their fame. He thought and spoke in a manner peculiar to himself; his pleasingly flowed as from an abundant source; he never fought for them; and they appeared to natural, pleasant, and lively, that it was impossible not to be struck by them. But he displayed his wit only among his friends; he never lavished it on the rich and great; on the contrary, he concealed it, when invited merely for the purpose of being heard. He always spoke the truth, without regard to person or rank." Rabener, says he, was the favourite author of Germany, who wrote poetically in prose, whose fatrical, spective geniuspossessed itself without gail. Rabener's works are generally known throughout Europe, having been translated into the French, English, Dutch, and Swedish languages. Gen. Biog.

RABENSPURG, in Geography, a town of Austria; 8 miles S.E. of Lifferdorff.

RABENSTAIN, a town of Austria, on the river Bie- lach; 8 miles S. of St. Polten.

RABENSTEIN, a town of Bohemia, in the circle of Leitmeritz; 40 miles E. of Prague. N. lat. 50°. E. long. 13° 20'.—Also, a town of the duchy of Sturia; 11 miles N.N.W. of Graz.—Also, a town of Bavaria, in the bishopric of Bamberg; 2 miles S. of Weissenfeld.

RABIA PINU, in Chronology, is the name of the third month of the Arabic year, consisting of thirty days; and Rabia posterior is the name of the fourth month, consisting of twenty-nine days.

RABICHS, a name given by Leo Africanus to a tree or shrub growing very plentifully in many parts of Africa, the fruit of which is much esteemed by the natives. He says that the tree rabich is prickly, and that the fruit is round, and like a cherry, but smaller, and of the taste of the jujube.

RABIEL, a name given by some authors to dragon's blood.

RABIES, in Medicine, that peculiar state of the nervous system, which is produced by the bite of a rabid animal, and which is commonly, but improperly, called madnus. As the dog is the principal source of this disease, the word rabies is commonly united with the epithet canina. See Hydrophobia.

RABINAL, in Geography, a town of Mexico, in the province of Vera Paz; 40 miles S.S.W. of Vera Paz.

RABINET, a name formerly given to a small piece of ordnance, between a falconet and a bateau. Its dimensions, &c. see under CANNON.

RABIRA, a word used by some of the chemical writers to express tin.

RABISHI, in Geography, a river of the island of St. Vincent, forming a bay on the eastern coast, near the southern extremity, where it runs into the sea. N. lat. 13° 5'; W. long. 61° 11'.

RABLAY, a town of France, in the department of the Mayne and Loire; 9 miles N. of Villiers.

RABLES, jux. aux, a cluster of small islands at the entrance of lake Superior, in Upper Canada, and at the eais of it, eait of White-Fish island, and pretty close to the main land.

RABNABAD, a town of Hindoostan, in Bengal, at the mouth of the Ganges; 90 miles S.S.E. of Mahmundpore.—Also, a small island on the coast of Bengal, at the mouth of the Ganges. N. lat. 22°. E. long. 90° 30'.—Also, one of the mouths of the Ganges, which opens into the bay of Bengal. N. lat. 22°. E. long. 90° 26'.

RABNITZ, a river of Hungary, which runs into the Danube, a little below Raab.

RABOGH, a town of Arabia, in the province of Yemen, near the coast of the Red sea, where the Arabs live in huts; 105 miles S.W. of Medina.

RABOLAN, in Ornithology, a name given by many to the lagopus, a bird found on the snowly mountains, and called by some the white partridge.
RABRI, a name given by some authors to hole Armenian.

RABUEL, CLAUDE, in Biography, a French Jesuit and able mathematician, was born at Pont-de-Veyle, in the county of Bresse, in the year 1668. About the age of 18 he was entered into the society of Jesus, and principally distinguished himself by his proficency in mathematical learning, of which he became the professor in Trinity college at Lyons, performing its duties with great reputation and success. He died in 1728, in the 60th year of his age. His chief work was "A Commentary on the Geometry of Descartes," which was published after his death in 1730, under the care of father L'Epinal. This was the first illustration of the whole of that work, which had been given to the public. The labours of Fermat, De Witt, and others, extended only to particular parts of it. Rabuel left behind him other works on algebra, the conic sections, and the geometrical loci of the differential calculus, and of the integral calculus; and he was one of the few infallances of persons who, with a passion for the mathematics, had a fine taste for polite literature.

RABUTAH, in Geography, a town of Africa, in the kingdom of Senmaar; 35 miles S.S.W. of Sennaar.

RABUTIN, FRANS DE, in Biography, who flourished in the sixteenth century, was of an ancient and noble family in Burgundy, and served in the army with the duke of Nevers, under Henry II. and Charles IX., with a high reputation for valour and fidelity. He lived in 1581, but nothing is known of him beyond that period. He was author of "Commentaires de dernieres Guerres du Roi Henri II. et de l'Empereur Charles Quint," first printed in 1555; a continuation was printed afterwards, in 1558; and the whole work together in 11 books, in 1574. It contains a history of the wars in the Low Countries, from 1550 to 1558, and is said to be written in a simple style, with a great appearance of vivacity.

RABUTIN, ROGER DE, count of Buffi, a very distinguished character in the reign of Lewis XIV., was born at Epire, in the Nivernois, in 1618. He entered very young into the army, in his father's (Leonor Baron of Buffi) regiment, of which he became colonel. After serving in a number of battles and sieges, he rose to the rank of major-general of the Nivernois. He looked for still higher honours, and being disappointed, engaged in lampoons upon persons about the court, which drew upon him the king's displeasure; and in 1665, in which year he was admitted a member of the French Academy, a manuscript history of the amours of two court ladies, of which he was the writer, being handed about, under the title of "Histoire Amoureuse des Gales," a complaint was laid before his majesty, in consequence of which he was sent to the Bastille. Imprisonment had nearly proved fatal to him, and he was liberated, but was obliged to resign the office which he held under-government. After this he was exiled to his country-seat, where he remained 17 years, during which he did not cease to importune the king to be allowed to return, by letters conceived in terms of abject humility and base adulation. In 1682 he was allowed to return to court, but finding himself generally neglected, he retired of his own accord to his estates. He died at Autun in 1693, at the age of 75. He was author of several works, among which were "Difficultes des Enfans, pour le bon Usage des Adverstices;" "Memoires," published first at Paris in two, and afterwards at Amsterdam in three volumes, 4to.; "Letters," 7 vols. 12mo.; and "Histoire Abregée de Louis le Grand." His son the abbé de Buffi became bishop of Liége in 1723, and was a learned and ingenious member of the French Academy.

The sister of the bishop, a nun, published an abridgment of the life of Madame de Chantal, and of the life of St. Francis de Sales.

RABY, in Geography, a small township of America, in New Hampshire, in Hillsborough county; about 65 miles W. by S. of Portsmouth; incorporated in 1750. Its name has been since changed.—Also, a town of Bohemia, in the circle of Prachatitz, containing a citadel, at the siege of which, Zicca, general of the Hussites, lost his only remaining eye; 4 miles S. of Horazdowiz.—Also, a town of Sweden, in Sudermanland; 7 miles N. of Nyköping.

RACA, or RACHA, a Syriac term, found in the Gospel of St. Matthew, chap. v. 22, and preferred in most translations.

Father Simon observes, that the Greek translator of St. Matthew's Gospel retained the Syriac race, which he found in the original, because it was very common among the Jews. And St. Jerome, Luther, the English translators, chose of Geneva, Lowman, Port royal, &c. still prefer it in their respective languages.

F. Bouhours chooses rather to express the sense of it in a sort of paraphrase, thus: he that fays to his brother, whom you have done wrong, man of little understanding, shall deserve to be condemned by the tribunal of the council, &c.

Most translators, except the English, and F. Simon, for raca write racha; but the former orthography seems the best founded; all the Latin copies having raca, and all the Greek ones ᾲχα, or, with Hefychius, ἴχα, which is the same; all, we mean, but St. Irenæus, and Beza's copy, now at Cambridge, which have ἴχα. In effect, the origin of the word shews it should be racha; as coming from the Syriac ἱχα, raca, of the Hebrew rek, ἱχα, empty, shallow.

RACAISBONE, in Geography, a town of Hindoostan, in Aurungsabad; 30 miles S. of Aurungsabad.

RACAM, a town of New Mexico, in the province of Hiaquii; 60 miles S.W. of Riochico.

RACAN, HONORAT DE BUEIL, Marquis of, in Biography, a French poet, was born in 1589, of a noble family, in Touraine. When very young, he had a place in the king's bed-chamber, under the duke of Bellegarde. From Malherbe, who was at that time domiciliated with the duke, he acquired a fondness for poetry, and obtained instructions in the art of verifying. He at first bore arms, as a profession but after a time he devoted himself to the life of leisure. He was one of the earliest members of the French academy, and though almost wholly without the advantages of education, he obtained reputation as a writer. His most popular work was entitled "Bergeries." He composed in various styles, and wrote translations of Psalms, and many sacred odes taken from the Psalms, and other scriptural poems. In prose he published "The Life of Malherbe;" "A Discourse pronounced before the Academy;" and some "Letters." He died in 1670, at the age of 81. Of his works a new edition was given at Paris, in 1724, in 2 vols. 12mo.

RACCA, RACAH, Rika, or Raka-Rica, in Geography, a town of the Persian empire, in the province of Dazbekir, and pashahic of Orfu, the capital of the district named Dier Medzir. It is situated on the eastern bank of the river Euphrates, at the mouth of a small river named Beles, (the ancient Bilehca,) and was founded, according to Phiny, by Alexander the Great. It was first called Nicopolis, and afterwards Callinicum and Leonopolis, from Seleucus Callinicus and the Greek emperor Leo. It was the favourite residence of Haroun al Ralîhîd, the ruins...
runs of whole palace, it is said, are still visible. The position of Racca, in the parallel of 36° N., was ascertained by the celebrated oriental astronomer Mahomed Ben Jaiber, surnamed Al Batani, who passed many years of his life at this place. The town and adjoining country are inhabited by different tribes of wandering Arabs. N. lat. 36° 1'. E. long. 48° 50'.

**RACCA**, a river on the north coast of Sumatra, which runs into the sea, N. lat. 2° 30'. E. long. 100° 15'.

**RACCANATTO**, a river of Naples, which runs into the gulf of Tarento, N. lat. 39° 47'. E. long. 16° 42'.

**RACCIOON** in Zoology. See Raccon. Raccoon, in Geography, an island in the Atlantic, near the coast of South Carolina, nine miles long and one wide. N. lat. 33° 3'. W. long. 79° 22'.

**RACCIOON Creek**, a river of Pennsylvania, which runs into the Ohio, N. lat. 40° 58'. W. long. 80° 25'.

**RACCOON Island**, a small island in Offabaw sound, belonging to the state of Georgia. N. lat. 31° 47'. W. long. 81° 12'.

**RACCOON Key**, a small island or rock in the gulf of Mexico, near the south coast of West Florida. N. lat. 29° 46'. W. long. 89° 21'.

**RACCOON Key**, a cluster of small islands near the coast of South Carolina. N. lat. 24° 8'. W. long. 79° 15'.

**RACCOURCY**, in Heraldry, signifies the name as eoupé, that is, cut off, or shortened; and denotes a cross, or other ordinary, when it does not extend to the edges of the escutcheon, as they always do when absolutely named, without such distinction.

**RACE**, in general, signifies running with others, in order to obtain a prize, either on foot, or by riding on horseback, in chariots, &c.

Racing was one of the exercises among the ancient Greek games, which was performed in a course, containing one hundred and twenty-five paces; and those who contended in these foot-races were frequently clothed in armour. For a particular account of these races, see STADIUM.

There were properly but two kinds of horse-races at Olympia, namely, the chariot-race, introduced into those games in the 25th Olympiad (for an account of which see CHARIOT), and the race of riding-horses, which was not admitted till the 33d. Although chariots were in use before riding-horses, as we may conclude from the testimony of Homer, among all those heroes, Greek and Trojan, no one makes his appearance on horseback, except Diomedes and Ulysses mounted upon the horses of Rhesus (Il. xi.), it is neverthelss plain, from this instance, that neither the heroes nor the horses were utter strangers to the art of riding; and it is also evident, from another passage in the 15th Iliad, that horsemanship was carried even to some degree of perfection, at least in the time of that poet, who lived but in the next generation after the siege of Troy, according to Sir Isaac Newton. This passage, extracted from Pope's Homer (Il. xv. v. 822.) is as follows:

"So when a horseman from the wat'ry mead
(Shk'd in the manage of the bounding reed)
Drives four fair couriers, practis'd to obey,
To some great city, thro' the public way:
Safe in his art, as shade by shade they run,
He shifts his seat, and vaults from one to one;
And now to this, and now to that he flies:
Amusing numbers follow with their eyes."

Some authors (see Rolin's Anc. Hist. tom. v. p. 72-74. Amst.) have introduced an exerere like this into the Olympic games, though Mr. Weft professes himself disfavored with the authority upon which they depend; and says that in the books which he has consulted, he can find no mention of any other race of riding-horses, besides those of the Celts and the Caliphs. As to that particular branch of horsemanship, above described, Eustathius, in his comment upon Homer, tells us, that in the old scholia it is written, that Demetrius says he had seen a man, vaulting in the manner described by the poet, from the back of one horse to another, holding the bridles at the same time, and keeping the horses to their speed, without any interruption or incurrence. This assertion implies that such a fight was very uncommon, and consequently that no such exercise could ever have been admitted into any of the games of Greece. The word Kabe, used by the poet in the beginning of this simile, says Mr. Weft, may possibly have induced some people to imagine, that the riders of the horses called Kabe, celeres, were accustomed to leap from one horse to another, as if that word was a term of the manage, of which the ver fat followed were merely an explanation. It is certain, however, from a passage in the Odysseus (E. v. 371.) that by Kas, Homer meant to signify no more than a riding-horse, and consequently that by the word Kabe, Kabe, which is derived from Kabe, no more is to be understood in this place than simply to ride. This interpretation of Kabe, celeres, may be further confirmed by the authorities of Pindar and Pausanias, and particularly by a story related by the last mentioned author (lib. vi. c. 13.) of a mare, named Aura, belonging to one Phidolas, a Corinthian. This mare, says the historian, having accidentally thrown her rider long after she had startled from the barrier, continued the race of her own accord, and turned round the pillar as if the rider had been still upon her back; upon hearing the trumpet, she mended her pace, till coming in before her antagonists, she stopped short over against the judges of the games, as conscious of having gained the victory. The victory was accordingly adjudged to her master Phidolas, who, by erecting in return a statue to her honour, intimated to whom the merit of that victory was due. In this story, there is no mention of any other horse or mare, that shared the victory with Aura, and consequently that, in the race called Celtes, each competitor made use of but one single horse. Moreover, the victorious Aura was of the feminine gender, and hence we may infer, that in all the races, as well of riding horses as of chariots, mares or horses were indiscriminately used; excepting in the race named Caliphs, in which mares only were employed. And further it appears, that though the rider was thrown off in the very beginning of the race, yet the crown was awarded to Phidolas, the master of Aura; to whom certainly no less was due, than if his mare had conquered under the conduct and discretion of her rider. It appears also, by the circumstance of Aura's mending her pace upon hearing the trumpet, that the trumpet either did not sound during the whole race, but at the last round only, or that it sounded differently in different periods of the course.

There was, however, a meaning in the found of the trumpet, which Aura, probably an old fitter, understood.

The race of full-aged riding-horses was instituted in the 33d Olympiad, and that of the Horses, or aged under-aged riding-horses, in the 131st. It is a well-known fact that chariots were used in war above 1000 years before cavalry was introduced among the ancients. They seem to have had a terrible notion of being mounted upon the back of a horse, and have accordingly made monilars of their horse whom they first beheld in that attitude, to which they were not very speedily reconciled. Their amazement gradually diminished; and their intercourse with other nations not only rendered
rendered riding-horses familiar to them, but convinced them likewise of the advantages accruing from the use of cavalry. Hence it came to pass, that an order of equites, or horsemen, was instituted in most of their commonwealths; to whom, as in Athens, was allotted the second rank in the lists. Upon the same principle, perhaps, the #error start here.  

It is to be noted, that the name of the horse Phereinus, whose steeds gained for his master the Olympic crown. The race of the Caphé was performed by mares. (See Calpé.) The length of this race, and also that of the Celes, are not ascertained; but it is reasonable to suppose, that the latter, distinguished, as we have already observed, into two classes, one of full-aged, and the other of under-aged horses, consisted of the same number of rounds as those of the chariots, distinguished in like manner into two classes. Mr. Wells has not been able to determine the different ages that ranked the horses in one or the other class; nor whether the weight of the riders, or the sizes of the horses, were taken into consideration. These points seem to have been left to the discretion of the Hollendicks, who were appointed to examine the young horses that were entered to run for any of the equestrian crowns (Paul. I. iv. c. 24.), and who were sworn before the statue of Jupiter Horaeus, to give a true and impartial judgment upon the matters left to their examination, without taking any reward; and not to discover the reasons which disposed them to reject some, and admit others. Wells's Dissertation on the Olympic Games. Sec. 14. See Hippodrome.

Race, in Genealogy, a lineage, or extraction, continued from father to son.

The word is French, formed from the Latin radix, root; as intimating the root of the genealogical tree.

In several orders of knighthood, as in that of Malta, &c. the candidates must prove a nobility of four races or defectents.

In some republics the magistrates are to prove themselves of plebeian race, to be qualified.

The French reckon their kings by races; as, the first race, the second race, the third race. We also lay the race of the Ottomans, the Araphis, the Polesmens, &c.

Race, in Natural History. See Cibdeloplia.

Race, the mark made on timber, &c. by a tool called a racing-knife.

Race, Cape, in Geography, a cape on the S.E. coast of Newfoundland. N. lat. 46° 40'. W. long. 53° 3' 30'.'

Race Point, a cape on the coast of America, W. of cape Cod. N. lat. 42° 3'. W. long. 78° 12'.

Raceme, in Gardening, the long mode of cluster-flowering and fruiting which takes place in some sorts of plants and fruit-trees, as in the grape-vine, and the different kinds of currants. See Racemus.

Racemiferous, in Botany, denotes bearing in clusters.

Racemus, in Botany and Vegetable Physiology, a cluster, is a mode of inflorescence, in which several flowers, each supported on its own proper stalk, are connected by one common stalk, either simple or compound. A bunch of Crucifers is a simple racemus; the inflorescence of the Woody Nightshade, Solanum Dulcamara, is a compound one. In the American plant called Astra racemosa, the clusters are simple, but aggregate. A racemus differs from a spica, or spike, in having a partial stalk, as above described, to each flower; it is moreover generally understood to be drooping or pendulous, and to have the flowers expand all nearly at one time. On the contrary, a spike is most frequently erect; the flowers open in very gradual succession, insomuch that the lowermost may have partly perfected their seeds, before the uppermost expands; and especially, they are individually fertile, at least at the time of their expansion. To these characters may be added, that a spike is crowded or dense; a cluster lax or scattered. It must be allowed that botanists, even of the first rank, are incorrect in the application of these terms. The male inflorescence of Quercus, the Oak genus, because drooping and loosely disposed, with all the flowers in perfection nearly at the same time, is termed a racemus; though it poifesses the most essential character of a spica, fertile flowers. On the other hand, Veronica spicata, having a dense upright series of flowers, expanding gradually, is said to be spied, though each separate flower has a partial stalk. A little latitude must necessarily be allowed, though it is very desirable that botanists should be more exact in the use of these and other terms, than they sometimes are. See Spica and Inflorescence.

Racer, in Gardening, a name applied to a fort of fward-cutter, or cutting implement, used in racing out or cutting through the surface of grazs fward, and dividing it into proper widths, lengths, and thicknesses, for turf intended to be cut up, for laying in pleasure-grounds, or other places, and always necessary preparatory to the work of faying or cutting up the turf with the turfing-iron. It is also useful for cutting and straightening the edges of grass verges in such grounds, as well as for many other purposes.

It is a tool which is very simple in its construction, merely consisting of a strong wooden handle, about four feet long, having the cutter fixed at the lower end, in the form of a half moon, with the edge downward, to cut into the fward; the handle should be about an inch and a half thick, growing gradually thicker towards the lower end.

In using the tool, it is pulshed forward as to cut or race out the fward in an expeditious manner. And in cutting turfs with it, it is necessary first to mark out on the fward the width of the turf intended, which should generally be a foot wide, and a yard long, and about an inch or inch and a half deep; then itain a line tight, first lengthways, striking the racer into the fward clofe to the line, running it along expeditiously, so as to cut its way, and divide the fward to a proper depth, afterwards placing a line a foot farther, and racing it out as before, and so on, to as many widths as may be wanted; and then, with the line placed cross-ways, to race out the fward accordingly in yard lengths. The fward being thus raced out, the turf-cutter with the turfing-iron should proceed to cut them up and fay them off from the ground. This small implement is likewise very convenient for many other little purpofes about pleasure-grounds and gardens, as thoole of cutting the edges of the verges which are laid with turf, and straightening the edges of the borders in different parts. See Turf.

Racha. See Raca.

Racha, in Geography, a town of Bohemia, in the circle of Leitmeritz; 8 miles E. of Leitmeritz.

Rachelsdorf, a town of Bavaria, in the bishopric of Bamberg; 15 miles N. of Bamberg.

Rachetum, from the Fr. racheter, rudiment, the compensation or redemption of a thief.

Rachia,
RACHIA, in Geography, a town of Ilithri; 7 miles N.E. of Pedena.

RACHIALGIA, in Medicine, a term given by Alfric, and adopted by the nomenclaturists, to denote certain colicky pains in the bowels, which were supposed to originate from the nerves of the spine, and especially from the colic from the poison of lead, or COLIC PAINUM; which see. The word is from ραχία, the spine, and αἰχμή, pain. See Sauvages Nouf. Meth. cliv. vii. gen. 29.

RACHIS, or rather Rhachis, in Botany, from ραχία, the back-bone, is the common stalk, or receptacle, of the florets, in the spikelike clusters of grasses; or of the spikelike themselves in Lolium, Triticum, Scite, Hordeum, Reutiolias, &c. The same term is applied to the rib, or leaf-leaf, of ferns, which is often winged or bordered. The Rachis in both these inflorescences is frequently jointed; by which in the former, the ripe seeds of such grasses, wrapped up in their husks, are the more readily dispersed. The part in question being in some cases smooth, in others variously hairy or bearded, affords excellent specific distinctions; witness the genus Avena.

RACHISAGRA, a term used by some physicians for the gout in the spine of the back.

RACHITIS, a term used by some physicians for the gout in the spine of the back.

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race, elegance, correctness, good taste, refined sentiments, and
the art of verifying in a supreme degree, so that his country-
men find a charm in his lines, which distinguishes them from
other French poetry. The criticisms of Boileau contributed
much to his excellence in this particular, and he is said to
have taught him, as a great secret, to write the second line of
a couplet first. With respect to the proper dramatic merit.
Racine must be judged by those who are formed to the
French school, and are not readily wearied with long speeches,
rather descriptive of feeling than expressing it, and all refine-
ments of the tender passion, often applied to characters, to
which is historically unsuitable. Many parts of his best
pieces, however, prove that his mind was well furnished with
elevated and dignified sentiments, which he probably derived
from an afflusive study of the ancients. Besides his dramatic
works, Racine was author of " Cantiques," replete with the
unction of tender devotion; " L'Histoire de Port-
Royal;" " Idylle sur la Paix;" " Epigrams;" Letters," and
some " Opuscules," as he was member of the French academy
from 1673, and as director of that institution he pronounced
the eulogy of Corneille. The best edition of his works is in
seven vols. 8vo. 1768.

RACINE, Louis, son of the preceding, also a disting-
guished poet, was born at Paris in 1692. He was, however,
not more distinguished for his poetry than for his piety, and
adopted the ecclesiastical habit. In a state of retirement,
in 1720, he published his poem " On Grace." The chan-
cello d'Audigeau, during his own exile at Frennes, brought
Racine again into the world, and cardinal Fleury afterwards
gave him a place in the finances. He married, and lived
very happily in his family, till the loss of an only son threw
him into a deep melancholy. His religious sentiments took
full possession of his soul, the fervour of which may be esti-
ated from the line by Tibullus which he inscribed on the
crucifix which ever accompanied him:

"Te fpeccem suprema mili cum venerit hora,
Te teneam moriens defciente manu."

He died in 1763, at the age of 71. His poetical writings are
"Poems on Religion and Grace;" " Odes," of which the
diction is splendid, and the sentiments elevated; " Epif-
tles," and a " Translation of Milton's Paradise Lost." In
profe he wrote " Reflexions sur la Poësie;" " Memoires sur
la Vie de Jean Racine;" " Remarques sur les Tragedies de
J. Racine;" besides these he contributed several disserta-
tions to the Memoirs of the Academy of Inscriptions, of
which he was a member. His works were collected and
published in 6 vols. 12mo.

RACINE, Bonaventure, a learned French priest and
ecclesiastical historian, was born at Chauny, in the diocese of
Noyon, in the year 1708. He received an excellent edu-
cation at the Mazarin college at Paris, where he not only
studied the ancient languages, but entered pretty fully into
the different branches of philosophy, divinity, and the stu-
dies connected with ecclesiastical history. At the age of
twenty-one he was entrusted by the archbishop of Alby, as
aift perfon, to re-establish the college of Rabaffens, a town
in his diocese. To this design he devoted his talents with
unwearied zeal and assiduity, and was abundantly compens-
ated by the successe which attended his labours. The in-
stitution was, in a short time, crowded with students who
unselfed from his lectures a taste for science and literature.
Thus usefully engaged, he became an object of the jealousy
of the witty Jefuits, who cauffered him to be banished from
Rabaffens. He retired to Montpelier, where M. Colbert
engaged him to undertake the direction of the college of
Jansen: from this place he was also driven by the fame per-
secutors, and he found it necessary to withdraw secretly to
Paris, where he was invited to undertake the education of
certain young perfon at the college of Harcourt, in con-
nection with some other ecclesiastics. Here his old enemies
the Jefuits pursuah him, and an order was obtained from
cardinal Fleury, in 1734, to deprive him of his office of
tutor. In the following year M. de Caylus, bishop of
Auzerre, nominated him to a canonry in his cathedral, and
ordered him priest; but his new dignity produced no al-
teration in his manner of living, nor in the distribution of
his time, which was as skilful wholly spent in devotion and
study. From this time he felt about preparing to publish the
collections that he had made in ecclesiastical history, and in
1748 he set into the world the first volumes of an " Abridg-
ment of Universal History," containing the principal Events
in every Century, with Reflections," in 12mo. These were
followed by others, to the number of thirteen, the last making
its appearance in the year 1753. This work, written in a neat,
peripetuous, and simple style, was well received, and be-
came extremely popular. The labour which it cost him his
weak constitution was unable to sustain; he sunk under his
exertions in the 47th year of his age. He was characterized
by the excellence of his manners and the amiableness of his
temper, and he had an ardent zeal for what he regarded as
truth, which approached to enthusiasm. Two other volumes
have been added since his death to the History, but they are
the work of an inferior hand, and unworthy of being placed
in conjunction with those of Racine. Morei.

RACING, the riding of heats for a plate or other pre-
mium. Horoes for this use should be as light as possible,
large, long, and well-shaped, nervous, of great mettle, and
good wind, with small legs, and neat small-shaped feet.

The first thing to be considered in this sort of gaming is
the choice of a rider; for it is not only necessary that he
should be very expert and able, but he must also be very
honest.

He must have a very close feat, his knees being turned
close to the saddle flirts, and held firmly there, and the toes
turned inwards, so that the fpurs may be turned outward to
the horse's belly; his left hand governing the horse's mouth,
and his right the whip. During the whole time of the
race, he must take care to fit firm in the saddle, without
waving or flanding up in the air. Some jockies fancy
this is a becoming feat, but it is certain, that all motions
of this kind do really incommodate the horse. In spurri-
ng the horse, it is not to be done by flicking the calves of
the legs close to the horse's sides, as if we were intended to
press the wind out of his body; but, on the contrary, the toes
are to be turned a little outwards, that the heels being
brought in, the spurs may just be brought to touch the
sides. A sharp touch of this kind will be of more service
toward the quickening of a horse's pace, and will sooner
draw blood than one of the common coarse kicks. The
expert jockey will never spur his horse until there is great
occasion, and then he will avoid striking him under the
fore-bowels between the shoulders and the girth; this is the
tenderest part of a horse, and a touch there is to be re-
served for the greatest extremity.

As to whipping the horse, it ought always to be done
over the shoulder, on the near side, except in very hard run-
ing, and on the point of victory; then the horse is to be
struck on the flank with a strong jerk; for the loin is the
most tender of all there, and most feasible of the lath.

When a horse is whipped and spurred, and is at the top of
his speed; if he claps his ears in his nose, or whisks his
tail, it is a proof that the jockey heats him hard, and then
he ought to give him as much comfort as he can, by faw-
...
ing the snaffle backwards and forwards in his mouth, and
by that means forcing him to open his mouth, which will
give him wind, and be of great service. If there be any
high wind stirring in the time of riding, the artful jockey
will let his adversary lead, holding hard behind him, till he
sees an opportunity of giving a loose; yet in this case, he
must keep so close behind, that the other horse may keep
the wind from him; and that he, sitting low, may at once
shelter himself under him, and afflict the strength of the
horse. If the wind happen to be in their back, a jilt con-
trary method is to be taken with it; the expert jockey is
to keep directly behind the adversary that he may have all
the advantage of the wind to blow his horfe along, as it were,
and at the same time intercept it in regard to his ad-
versary.

When running on level carpet-ground, the jockey is to
bear his horfe as much as the adversary will give him leave,
because the horfe is naturally more inclined to spurn him-
self on this ground; on the contrary, on deep earths he may
have more liberty, as he will there spare himself.

In riding up hill the horfe is always to be favoured, by
bearing him hard, for fear of running him out of wind;
but in running down hill, if the horfe's feet and shoulders
will bear it, and the rider dares venture his neck, he may
have a full loose. If the horfe have the heels of the reft,
the jockey must always spare him a little, that he may
have a reserve of strength, to make a pull at the last poft.

A great deal depends on the jockey's knowing the nature
of the horfe that is to run against him; for by managing
accordingly, great advantages are to be obtained: thus, if
the opposite horfe is of a hot and fiery disposition, the jockey
is either to run just behind him, or check by jowl with him,
imposing a noise with the whip, and by that means forcing
him on faster than his rider would have him, and confe-
quently spending him so much the sooner; or else keep
just before him, in such a flow gallop, that he may either
over-reach, or by treading on the heels of the fore horfe,
dernager tumbling over.

Whatever be the ground that the adversary's horfe runs
woret on, the cunning jockey is to ride the most violently
over; that by this means it will often happen, that in fol-
lowing he either flumbles or claps on the back fnews. The
several corrections of the hand, the whip, and the spur, are
also to be observed in the adversary, and in what manner he
makes use of them: and when it is perceived, by any of the
symptoms, of holding down the ears, or whifhing the
tail, or stretching out the nose like a pig, that the horfe is
almost blown, the businesfs is to keep him on to this speed,
and he will be foon thrown out, or dinned off. If the horfe
of the opponent looks dull, it is a sign his strength fails him;
and if his flanks beat much, it is a sign that his wind begins
to fail him, and his strength will soon do too.

After every heat for a plate, there muft be dry flraw, and
dry cloths, both linen and woollen, ready to rub him down
all over, after taking off the sweat with what is called a
sweat-knife; that is, a piece of an old sword-blade, or some
similar thing. Some advise the steeping of the clothes in urin
and saltpetre the day before, and letting them be dried in
the sun for this occasion. After the horfe has been well
rubbed with this, he should be chafed all over, with clothes
wetted in common water, till the time of starting again.
When it is certainly known that the horfe is good at the
bottom, and will tick at the mark, he should be rid every
heat to the best of his performance; and the jockey is, as
much as poffible, to avoid riding at any particular horfe, or
flying for any, but to ride out the whole heat with the
best speed he can. It, on the contrary, he has a fiery horfe
to ride, and one that is hard to manage, hard-mouthed, and
difficult to be held, he is to be started behind the reft of
the horfes with all imaginable coolnefs and gentleness; and
when he begins to ride at fome command, then the jockey
is to put up to the other horfes; and if they ride at their
cafe, and are hard held, they are to be drawn on faster; and
if it be perceived that their wind begins to rake hot, and they
want a lab, the businesfs is to keep them up to that speed;
and when they are all come within three quarters of a mile
of the poft, then is the time to pull for it, and use the ut-
moft speed in the creature's power.

When the race is over, the horfe is immediately to be
clothed up, and rode home; and immediately on his coming
into the Stable, the following drink is to be given him.
Beat up the yolks of three eggs, and put them into a pint
and a half of new milk made warm; let there be added to
this three pennychworth of faffron, and three spoufuls of
fallad-oil, and let the whole be given with a horn. After
this he is to be rubbed well down, and the saddle-place
rubbed over with warm fack, and the places where the
fpiurs have touched, with a mixture of urine and falt, and
afterwards with a mixture of powder of jet and Venice tur-
pentine; after this he should have a feed of rye-bread, then
a good malt, and at some time after these as much hay and
oats as he will eat. His legs, after this, should be bathed
fome time with a mixture of urine and saltpetre.

For the preparation of the horfe before running, &c. see
PLATE.

We shall here obferve, that horfe-races were a species
of amusement known in England in very early times. Fitz-
Stephen, who wrote in the days of Henry II. records
the great delight which the citizens of London took in the
divertion.  Racing appear likewise to have been in vogue
in the reign of queen Elizabeth, and to have been carried
to fuch excefs as to have injured the fortunes of the nobi-
licity. Lord Herbert of Cherbury (fee his Life by Mr.
Walpole, p. 51.) enumerates thefe among the fports which
he thought unworthy of a man of honour. " The exercife,"
says he, " I do not approve of is running of horfes, there
being much cheating in that kind; neither do I fee why a
brave man should delight in a creature whose chief ufe is to
help him to run away." Jarvis Markham, who wrote on the
management of horfes in 1599, mentions running horfes;
but at this time there were only private matches made be-
tween gentlemen, who were their own jockeys, and rode
their own horfes. However, in the following reign of
James I., public races were established; and Gartery, in
Yorkshire, Croydon, near London, and sometimes Theo-
hald's, near Enfield-chace, where the king refided, were the
courfes in which they were performed. The horfes at this
time were prepared for running by the discipline of food,
phyfic, airing, and fweats and clothing, which complete the
preffent syftem. The weight also which each horfe was to
carry was rigidly adjudged; the usual weight of the riders
being flated at ten flones, who were put into fcales, and
weighed before they started. Most of the celebratfed races
in the kingdom were called bell-courfes, the prize and re-
ward of the conquering horfes being a bell. To this pur-
pofe, Camden fays, that in 1607 there were races near York,
and the prize was a little golden bell. Upon this Be-
renger offers a conjecture, whether the phrase of bearing
the bell, which implies being comparatively the beft or most
excellent, and corresponds with the expreffion of bearing
the palm among the ancients, as a reward decreed to the
swiftest horfe in a race, is not more aptly deduced from this
custom,
custom, than from the method of tying a bell round the
neck of the sheep, which leads the flock, and is, therefore,
counted the bell.

About the latter end of the reign of Charles I. it was
customary to have races performed in Hyde Park. See the
Comedy of the Merry Beggars, or Jovial Crew, written in
1641, in Dudley's Collection of Old Plays.

Racing was much encouraged by Charles II. after his
restoration: he gave public rewards and prizes, and ap-
pointed races for his own amusement at Datchet Mead,
when he resided at WindSOR. But the most distinguished
spot for these exercizes was Newmarket, which was at first
frequented for the purpose of hunting, and seems not to
have been destined to be a horse-courfe till some time be-
fore the troubles of the reign of Charles I. when races
were discontinued; but they were revived soon after the
Restoration. The king attended in person, and established
a house for his accommodation, and kept and entered horses
in his own name. Instead of bells, a silver bowl or cup,
of the value of a hundred guineas, was allotted for a prize;
and upon this royal gift the exploits of the successful horse,
and his pedigrees, were generally engraved. The sum of
a hundred guineas is now given in lieu of the silver bowl.

When William III. was advanced to the throne, he
was only added to the plates given to different places in the
kingdom, but founded an academy for riding. Queen Anne
continued the bounty of her predecessors, with the addition
of several plates. George I., towards the end of his reign,
discontinued the plates, and gave the sum of a hundred
guineas in their room.

In the thirteenth year of George II. an act was passed
for the suppression of races by poneys, and other small and
weak horses, by which all matches for any prize under the
value of 50l. are prohibited, under a penalty of 500l., to
be paid by the owner of each horse running, and 100l. by
both as adverfite the plate; and by which each horse entered
to run, if five years old, is obliged to carry ten stones; if fix,
eleven; and if seven, twelve. It is also ordained, that no
perfon shall run any horse at a course, unless it be his own,
or enter more than one horse for the same plate, upon
pain of forfeiting both horses; and also every horse-race must
be begun and ended in the same day. Horses may run for the
value of 50l. with any weight, and at any place. 13 Geo. II.
vol. i. p. 52, &c. Berenger's Hist. and Art of Horfemen-
ship, vol. i. p. 185, &c.

We shall here add, that at Newmarket there are two
courses, the long and the round: the firit is exactly four
miles, and about three hundred and eighty yards, i. e.
seven thousand four hundred and twenty yards. Chil-
ders, the swiftest horse ever known, has run the first course
in seven minutes and a half, and the second in six minutes
forty seconds; which is at the rate of more than forty-nine
feet in a second. But all other horses take up at least
seven minutes and fifty seconds in completing the first and
longeft course, and seven minutes only in the shorteft,
which is at the rate of more than forty-seven feet in a
second, and it is commonly suppos'd that these courfer
cover, at every bound, a space of ground in length about
twenty-four English feet.

RACITZA, in Geography, a town of Bukovina; 7
miles N. of Czernaucli.

RACK, a small island near the coast of Virginia. N.
lat. 37° 19'. W. long. 75° 51'.

Rack, Lower and Upper, two small islands near the coast
of Virginia; the former in N. lat. 37° 20'. W. long. 75°
50', and the latter in N. lat. 37° 20'. W. long. 75° 45'.

RACK, an engine of torture furnished with cords, &c.
for extortiog confessions from criminals.

The duke of Exeter, confidible of the TOWER under
Henry VI., with the duke of Suffolk, and others, having
a design to introduce the civil law into England; for a
beginning, the rack, or brake, allowed in many cases by the
civil law, was first brought to the TOWER, where it is still
preferred; in those days the rack was called the duke of
Exeter's daughter. 3 Hift. 35.

It was occasionally used as an engine of state, not of law,
more than once in the reign of queen Elizabeth. (Barr. 92.
496.) But when, upon the affailation of Villiers, duke of
Buckingham, by Felton, it was proposed in the privy-
council to put the affailant to the rack, in order to discover
his accomplices; the judges being consulted, declared unani-
mosly, to their own honour, and the honour of the English
law, that no such proceeding was allowable by the laws of
England. The uncertainty of this punishment, as a test,
and criterion of truth, was long ago very elegantly pointed
out by Tully (pro Sulla, 28.) though he lived in a state in
which it was usual to torture slaves, in order to furnish
evidence. "Tamen," says he, "illa tormenta gubernat
dolor, moderatur natura cujusque tum animi tum corporis,
regit quaeque, flecit libido, corrupit IPSIs, infirmat metus;
ut in tot rerum angustias nihil veritati loci rehauatur."

The marquis Beccaria (ch. 16.), in an exquisite piece
of raillery, has proposed this problem, with a gravity and
precision that are truly mathematical: "the force of the
muscles, and the sensibility of the nerves of an innocent
perfon being given, it is required to find the degree of pain
necessary to make him confess himself guilty of a given
crime."

Rack, in the Mange, a pace in which a horse neither
trots nor ambles, but shuffles, as it were, between both.
The shuffling pace is much the fame as the amble (which
fees); only that it is a twifter time, and a shorter tread.

Rack is also a wooden frame, made to hold hay or fodder
for cattle. There has lately been much improvement made
in the forming of all sorts of racks, both for the flable,
cattle-sheds, and field. See CATTLE-sheds, STABLE, and
SHEEP-sheds.

Rack, in Rigging, a short thin plank, with holes made
through it, containing a number of bailing-pins, used
stead of cleats; it is fixed to the shronds, and nailed over
the bowsprit or windlafs. Also, a long shell, containing
a number of sheaves, formerly fixed over the bowsprit to
lead in the running rigging. At present, wooden faddles,
with holes in them, are nailed on the bowsprit for this purpose,
being more out of the way, and less liable to be out of order.
See SHOT-rack, and SHroud-rack.

To Rack Wines, &c. is to draw them from off their lees,
after their having flooded enough to clear and settle.

RACK-Vintage, is frequently used for the second voyage
of our wine-merchants used to make into France for raked
wines; whence they used to return about the end of De-
ember: To Rack, Holders, such tenants as hold their lands
under such leases.

Rack-Leaves, are such sorts of leaves as are granted for
one or more lives, at the full rack rents, as in Cornwall,
and some other counties. See LEASES of LAND.

Rack-Rent, is the full yearly value of land let by lease,
payable by tenant for life or years, &c. See RENT.
RACK, *Sheep*, a sort of long narrow crib, fixed upon wheels, for containing hay for sheep, having a lid or covering on the top. It is very useful in bad weather, in the winter season, as preventing the hay from being wasted, and admitting the sheep to feed conveniently.

RACKAMA, in Geography, a lake of Syria, south of Hella and the ancient Babylon, is about 30 miles long, and flows into the Euphrates.

RACKEBY, a town of Sweden, in Weft Gotländ; 40 miles N.E. of Uddevalla.

RACK, a kind of bat for striking the ball at tennis; consisting usually of a lattice, or net-work, of cat-gut, strung very tight over a circle of wood, with a handle or shaft of a moderate length.

The word is formed from the French 

*raquette*, which Menage derives from the Latin *reticulum*, a diminutive of *reticet*, net; whence also reticium, and reticulum.

Pasquier observes, that anciently they used no rackets at tennis, but played with the palm of the hand; and hence he conjectures it is that the French call tennis play, *jeu de paume.* He adds, that rackets were not introduced till a little before his time.

Racket is also a machine which the savages of Canada bind to their feet, to enable them to walk more commodiously over the snow; made much in the manner of a tennis-racket.

Its figure is a lozenge, of which the two obtuse angles are rounded off. It is bound about with very fine thongs of leather, and the meshes of it are much smaller and closer than those of our rackets.

In the middle is fitted a kind of shoe, lined with wool, or hair; to be tied on to the ankle: by which means the feet are prevented from sinking in the snow. Rackets oblige the performer to take very long steps, and, as we say, to walk a great pace, to keep them from knocking against each other.

Racket, in Geography, a river of New York, which runs into the St. Lawrence, N. lat. 45° 13'. W. long. 74° 42'.

RACKIBIRN, the name of a small island on the N.W. coast of Ireland, situated near Tighlin head, in the county of Donegal. N. lat. 54° 39'. W. long. 8° 44'.

RACKING, in Sea Language, denotes the softening of two opposite parts of a tackle together, so as that any weighty body suspended by it shall not fall down, although the rope, which forms the tackle, should be loosened by accident or neglect. This expedient is chiefly practised when the boats are hung up to the ship's side on shore, in an open road or bay, left the rope of the tackle should be untied by the intentionate of some of the crew, by which accident the boat might be considerably damaged, and probably lost or dashed to pieces. Falconer.

Racking Fruit Liquor, the operations of fining and drawing it off. See Cider.

RACKLIA, in Geography, a small rocky island in the Grecian Archipelago, inhabited by two or three poor monks, who take care of a few sheep and goats. N. lat. 36° 53'. E. long. 25° 38'.

RACKNITZ, a town of the duchy of Carinthia; 3 miles S. of Saxenburg.

RACKON, or Raccoon, the *uroctos totalis* of Linnaeus, in Zoology, the name by which we commonly know an American animal, called *coati* by the Brazilians. It is something smaller than the beaver, and is of the shape of the beaver in the body, and its legs are as short as in that creature. The face, cheeks, and chin are white; the upper part of the body is covered with hair, long, soft, and thick; black at the ends, whitish in the middle, and ash-coloured at the root. Sometimes from this mixture of colour the back appears plainly grey; and Marshgrave mentions another species, which is of a deep yellow or ochre colour.

The head is very like that of the fox in shape; but that the ears are shorter, roundish, and naked, and it has from the forehead to the nose a dusky line. The eyes are large, and surrounded with two broad patches of black; the nose is black and sharp-pointed; its tail is very bushy, and annulated with black. Its feet are each divided into five slender toes; by the help of which it climbs trees as expertly as a monkey, and uses the fore-feet as hands, to reach up its food to its mouth. It is a very cleanly animal; and if there be water near, it always washes its food, be it what it will, before it eats it. It feeds on vegetables, but is also fond of eggs, and will even seize birds if it can catch them. It is also very fond of sweet things and strong liquors, and will get exceedingly drunk: at low-water it feeds much on oysters, watching their opening, and with its paw snapping out the fish, and is sometimes caught in the shell. It is very common in the warm and temperate parts of America, in the mountains of Jamaica, and in the isles of Maria in the South sea, and is a creature easily tamed. It is hunted for its skin; the fur, next to that of the beaver, being excellent for making hats. Ray and Pennant.

RACLER, Fr., to scrape, to rasp, or file a hard body. It is said, in derision of a bad performer on the violin, or any other instrument played with a bow, that he scrapes or rasp the strings; because, in fact, he draws a harsh and disagreeable tone from his instrument, which resembles that produced by scraping or filing a hard body. Even good players on the violin sometimes scrape a little in the fore parts of their performance. Suppl. to Encycl., 18 edit.

RACLERGUNGE, in Geography, a town of Bengal; 50 miles N.W. of Burdwan.

RACONIGI, a town of France, in the department of the Stura, containing four gates, with as many foyers, well peopled. The king of Sardinia had a palace here. The police is conducted by fifteen counsellors, from whom two syndics are chosen every four months, who act as bailiffs or mayors of the town. It has two parishes, and several religious houses. The inhabitants are industrious, and much employed in making gauzes and silk flusses; 6 miles N. of Savigliano.

RACOPILUM, in Botany, from *rachis*, a stem or garden, and *pilum*, a hat or cap; the name of one of Palmstot de Beauvoir's genera of mosses, whose veil is torn at the side. It ought to be written Rhacopilum.

RACOBEA, a name of Auber's, of which we find no explanation. See Homalium.

RACOW, Catechism of, in Ecclesiastical History, a fyttern of theology compiled by the most eminent Socinian doctores, and first published at Racow, or Rakow, in Poland, in the year 1609, with a dedication to our king James I. This catechism, or a translation of it, was committed to the flames in England, in the year 1653, by order of parliament. A new edition of it, corrected and enlarged, was published at Stuapoli, in 1684. The Socinians consider this catechism as the great standard of Socinism, and an accurate summary of the doctrine of that sect. However, Mofheim observes, that it is, in reality, no more than a collection of the popular tenets of the Socinians, and by no means a just representation of the secret opinions and sentiments of their doctors. Hence he says it never obtained among them the authority of a public consecration or rule of faith; and hence the doctors of that sect were authorised to correct and contra-
tradiit it, and to substitute another form of doctrine in its place. But to this account it has been replied, that it would have been inconsistent with the liberty, for which they argue in the preface to this catechism, to have limited their religious inquiries to this standard; and by treating it as a rule of faith, they would have violated their express declarations, that they dictated to no one, and assumed no authority. Moth. Eccl. Hist. See RAKOW.

RACON-COMPON, in Geography, a mountain of Tibet. N. lat. 31° 50'. E. long. 86° 14'.

RADA, a town of Sweden, in Warmeland; 33 miles N. of Carlstadt.—Alfo, a town of Sweden, in Warmeland; 35 miles S.E. of Carlstadt.—Alfo, a town of Sweden, in West Gotland; 5 miles W. of Gothenburg.—Alfo, a river of Welfphalia, which runs into the Ocker, 5 miles N.E. of Goflar.

RADANAGUR, a town of Hindooftan, in Bahar; 32 miles E. of Ramgur.

RADANI, a town of Sweden, in West Gotland; 16 miles N. of Uddevalla.

RADAR, a town of Persia, in the province of Chor- fán: 48 miles N. of Mefchid.

RADASALMI, a town of Sweden, in the province of Savolax; 20 miles N.N.W. of Nylofht.

RADAVITZA, a town of Prufia, in the palatinate of Culm; 22 miles E.S.E. of Culm.

RADAUN, a town of Austria; 6 miles W.S.W. of Vienna.

RADAUTZ, or RADENTZ, a town of Bukovina; 22 miles W.S.W. of Sazava.

RADAWAIR, a town of Hindooftan, in Candeif; 14 miles S.W. of Burhanpore.

RADBUZA, a river of Bohemia, that rises in the S.W. part of the cliff of Pifen, and runs into the Miza, near the town of Pilen.

RADCLIFFE, John, in Biography, an eminent and eccentric physician, was born at Wakefield, in Yorkshire, where his father possessed a moderate estate, in the year 1650. He received the rudiments of his classical education at a school in that town; and at the age of 15, was sent to complete his studies at University college, in Oxford. He took his bachelor's degree in arts in 1669, and removed to Lincoln college, where he was elected to a fellowship. Having determined upon the profession of physic, he went through the courses of botany, chemistry, and anatomy, and was distinguished by the rapidity of his attainments in all these pursuits. Nevertheless he did not apply with zeal or industry to the studies of the closet, and recommended himself rather by his vivacity, acuteness, and wit, than by any extraordinary acquisitions in any department of knowledge. In the prosecution of his medical inquiries, he contented himself with looking into the works of Dr. Willis, who was at that time practising in London with much reputation. He was poliſhèd, indeed, of very few books; infomuch that when Dr. Bathurst, head of Trinity college, asked him once with surprize where his study was? he pointed to a few vials, a skeleton, and a herbar, and said, "Sir, this is Radcliffe's library." He took the degree of master of arts in 1672, and in 1675 he proceeded bachelor of medicine, and immediately began to practice in Oxford. He professed to pay very little regard to the rules which were generally followed, but confounded them on many occasions with great freedom and acrimony; a conduct which did not fail to draw upon him the censure of all the old practitioners. Nevertheless his reputation and his practice rapidly increased; and before he had been two years in the world, he was very generally consulted, even by those of the highest rank. About this time, in consequence of some witticifms, which he had launched with his accustomed freedom against Dr. Marshall, rector of Lincoln college, the latter unkindly opposed his application for a dispensation for taking holy orders, which the statutes required, if he retained his fellowship, and shewed other tokens of incivility; which induced Radcliffe to resign his fellowship, quit the college, and take lodgings in the town. He continued to practise at Oxford, increasing his wealth and reputation, until 1683, having taken the degree of doctor in 1682; and he then determined to remove to London, and settled himself in Bow-street, Covent Garden.

His success in the metropolis was unusually rapid; and doubtless his wit and pleasantry, which rendered him a most entertaining companion, contributed fearfully less than his reputed skill in his profession to forward his progress. In less than a year he was in full practice; and in the second year, he was appointed physician to the princesse Anne of Denmark. In 1688, when prince George of Denmark joined the prince of Orange, and the princesse retired to Nottingham, in a state of pregnancy, he was prefixed by bishop Compton to attend her, in quality of his office; but he excused himself on account of the multiplicity of his patients. After the revolution, he was consulted by king William and the nobility about his court; an honour which he must have owed entirely to his high reputation, for he never shewed any inclination to be a courtier. By his rough independence of spirit and freedom of language, indeed, he ultimately lost all favour at court. In 1669, when king William returned from Holland in a state of severe indisposition, he feot for Radcliffe, and shewing him his swollen ankles, while the rest of his body was emaciated, said, "What think you of this?" "Why truly," replied the physician, "I would not have your majesty's two legs for your three kingdoms." This freedom was never forgiven by the king, and no intercessions could ever recover his favour towards Radcliffe. In 1694, when queen Mary caught the small-pox, and died, Radcliffe was accused, bishop Burnet says, of negligence and unkindness. He feo afterwards lost the favour of princesse Anne, by neglecting to obey her call from his too great attachment to the bottle, and another physician was appointed in his place. When queen Anne came to the throne, the earl of Godolphin exerted all his endeavours to reinstate him in his former post of chief physician; but he refused, alleging that Radcliffe would lend her word again, "that her ailments were nothing but the vapours." Nevertheless he is said to have been consulted in all cases of emergency, in a private way. In 1705 Dr. Radcliffe had an alarming and dangerous attack of pleurisy, which he neglected, and increased in the outlet by drinking a bottle of wine: he had, however, 100 ounces of blood taken from him by Mr. Bernard, the surgeon; and the next day, in spite of all intercessions, was carried to Ken-ington. His escape was almost miraculous. The queen asked Mr. Bernard how he did? and when he told her that he was ungovernable, and would observe no rules, he answered, that then nobody had reason to take any thing ill from him, since it was plain he used other people no worse than he used himself. During these ill days he made a will, by which he dispofed of the greater part of his property for charitable purposes, appropriating particularly several thousand pounds for the relief of sick women on shore. He recovered, however, and continued in full occupation in his profession, increasing in wealth and influence to the end of his days, and waging a perpetual war with his brethren; who, in their turn, represented him as an active, ingenious, adventurous empiric, whom constant
practice had brought at length to some skill in his profession. His caprice in the performance of his professional duties appears to have been unbounded; and many anecdotes are related of his refusal to attend on persons of distinction, if he happened to be engaged in pleasanter company, or had any personal pique against the individuals, or if he conceived himself in any way affronted. Thus he fell off suddenly for Bath in 1704, while attending the lady of Sir John Trevor, because that gentleman sent to Oxford for Dr. Breach to consult with him; which he had done as a compliment to Radcliffe, rather than join any of the London physicians with him. When Mr. Harley was stabbed by Gufheard, Swift complains, that by the caprice of Radcliffe, who would allow none but his own surgeon to be admitted, "he had not been well looked after;" and adds in another place, "Mr. Harley has had an ill surgeon, by the caprice of that puppy Dr. Radcliffe, which kept him back so long." On the other hand, he attended the lady of Sir John Holt in a bad illness, with unusual diligence, out of pique to the husband, who was not suppofed to be over fond of her. In the last illness of Queen Anne, he was sent for to his country-house at Carfhaltton about noon, by order, as one account affirms, of the privy council; but he returned an answer, that "he had taken physic, and could not come." It has been flated, however, on the other hand, that he was only sent for on this occasion by Lady Marlham, without any order from the queen or the council; which is countenanced by the following circumstances. On the 1st of August, four days after the queen's death, a friend of the doctor's moved in the houfe of commons, that he might be fummoned to attend in his place. (Dr. Radcliffe had been elected a member for Buckingham in 1714,) in order to be cenfured for not attending on her majesty. A letter is prefered, faid to have been written by the doctor to one of his friends, on this occasion, in which he fays, "I know the nature of attending crowned heads in their laft moments too well, to be fond of waiting upon them, without being fent for by a proper authority. You have heard of pardsons being figned for physicians before a sovereign's demifne; however, ill as I was, I would have went to the queen in a horfe-litter, had either her majesty, or thofe in the commiffion next to her, commanded me to do so." Whatever was the true cafe of the cafe, it is certain that Dr. Radcliffe became so much the object of popular reftentment, that he was apprehensive of being affaiufated, as appears from a letter addressed by him to Dr. Mead, which is extant. "Nor shall I be at any time from home," he fays, "because I have received several letters, which threaten me with being pulled to pieces, if ever I come to London." He ferved the queen but three months, and died at Carfhaltton, on the 10th of November 1714, at the age of 64. It was believed, that the dread which he had of the populace, and the want of company in his retirement, which he did not dare to leave, contributed to accelerate his death. He was carried to Oxford, and buried in St. Mary's church in that city.

It does not appear that Dr. Radcliffe ever attempted to write, and probably he would not have succeeded as an author. He was beloved, indeed, to have been very little converfant with books; which made Dr. Garth humorously say, that "for Radcliffe to infituue a library, was as if an eunuch should found a feraglio." He was often the fubject of the attacks of ridicule from poets and wits, and even was not spared on the stage; having been severely fatirized in a piece acted in 1704, soon after a legal dispute with an apothecary, which was attended by the ladies of the court, and in which the passages affronting the doctor were much applauded. Swift, in Martinus Scriblerus, and Steele in the Tatler, levelled their ridicule at the doctor; and the following severe portrait of him was drawn by Dr. Mandleville, in his Elfsay on Charity Schools. "That a man with small skill in phyfic, and hardly any learning, should by vile arts get into practice, and lay up great wealth, is no mighty wonder; but that he should do deeply work himself into the good opinion of the world as to gain the general esteem of a nation, and eftablish a reputation beyond all his contemporaries, with no other qualities but a perfect knowledge of mankind, and a capacity of making the most of it, is something extraordinary. If a man arrived to such a height of glory, should be almost diftracted with pride, sometimes give his attendance on a fervant, or any mean perfon, for nothing, and at the fame time neglect a noblcman that gives exorbitant fees; at other times, refuse to leave his bottle for his buncffe, without any regard to the quality of the persons that fort for him, or the danger they are in;—if he should be furry and morofe, affect to be a humourif, treat his patients like dogs, though people of distincfion, and value no man but what would defy him, and never call in question the certainty of his oracles:—if he fhould influt all the world, affront the firft nobility, and extend his infolence even to the royal family:—if, to maintain as well as to increase the fame of his sufficiency, he fhould scorn to consult with his better on what emergency fooer, look down with contempt on the moft deferving of his profession, and never confer with any other phyfician but what will pay homage to his superior genius, creep to his humour, and never approach him but with all the fquivif obfquifonif were a court flatterer can treat a prince with:—if a man in his life-time should difcover, on the one hand, fuch manifeft symptoms of fuperlative pride, and an infatiable greediness after wealth at the fame time; and on the other, no regard to religion, or affe<;ction to his kindred, no compaffion to the poor, and hardly any humanity to his fellow-creatures:—if he gave no proofs that he loved his country, had a public spirit, or was a lover of arts, of books, or of literature:—what must we judge of his motive, the principle he acted from, when after his death we find that he has left a trifle among his relations, who fiook in need of it, and an imme<;lute treasure to an univerfity that did not want it." Whatever may be the motives of the endowers of splendid infitutions for the public ufe, the nation is at all events benefited for ages, by fuch noble establishments as the library and in{irmary which he founded at Oxford, and which bear his name. He also endowed two travelling fellowsfhips, with an annual income of 300l. attached to each. He had previously caufed the beautiful cafe window, over the altar, in Univerfity college, to be put up at his own expe<;nfe; and likewise gave the money, which was paid for the erection of the maiter's lodge there, making one fide to the extent almoft of fpurring, and never could be induced to pay bills without much following and impatience. A piece of waggery would fometimes conquer this difpo{;fion. A pavior, after long and fruitless attempts, once caught him just getting out of his chariot, at his own door, in Bloomsbury square, and fet upon him. "Why, you rascal," faid the doctor, "do you pretend to be paid for fhuch a piece of work? Why, you have spoiled my pavement, and then covered it over with earth to hide your bad work."—"Doctor," f aid the pavior, "mine is not the only bad work the earth hides."—"You dog you," f aid the doctor, "are you a wit? You must be poor; come in;" and he paid him. He told Dr. Mead, that the great fecre<;t by which he might make his fortune was to "ufe all mankind ill." Dr. Mead, however, adopted the contrary
contrary axiom, and succeeded even beyond his adviser. Notwithstanding that Radcliffe seems to have literally prac-
ticed this principle, in his dealings both with his patients and his brethren; and notwithstanding the severe ac-
culations of ignorance and empiricism, which were every where
levelled against him; the universal reputation, which he ac-
quired and maintained, seems to sanction the testimony of
Dr. Mead, that "he was deferredly at the head of his pro-
feffion, on account of his great medical penetration and ex-
perience." See Atterbury's Epitaphial Correspondence.

RADDELE, in Geography, a town of Ceylon, on the
east coast; 5 miles N.E. of Trincomah.

RADDINSDORP, a town of the duchy of Holstein; 6
miles E.S.E. of Eutyn.

RADDLE, in Agriculture, a red ochre of iron, which,
according to Dr. Darwin, has been found useful as a ma-
nure in the northern parts of Staffordhire. Its properties
have not, however, been yet chemically examined as they
relate to manure. See REDDY.

RADEBURG, in Geography, a town of Saxony, in
the margravate of Meillen; 12 miles N.E. of Dresden.
N. lat. 51° 8'. E. long. 13° 53'.

RADECHAU, a town of Bohemia, in the circle of
Koniggratz; 9 miles S.E. of Trautenau.

RADEGATZ, a town of Germany, in the principality
of Anhalt-Deflau; 13 miles S.S.W. of Deflau.

RADEGURRY, a town of Hindoostan, in Carnara;
24 miles S.S.E. of Mangalore.

RADENTHAL, a town of the duchy of Carinthia;
13 miles E. of Saxenburg.

RADERAN, a town of Bohemia, in the circle of
Kauzim; 3 miles N.E. of Kauzim.

RADERMACHA, in Botany, a name originally given
to the Bread-fruit, (see Artocarpus,) by Thunberg,
in honour of one of his great patrons, Joachim Cornelius
Matthew Radermacher, a member of the Dutch council,
and President of the Society of Sciences, at Batavia.
The author, in his Nova Genera, p. 25, represents this gentle-
man as a most distinguished Magus, and encourager
of Natural History. Nevertheless, the above name has,
by common consent, given way to the expressive one of Forfer,
Artocarpus, which is precisely synonymous with Bread-
fruit.

RADERSBURG, in Geography, a town of Germany,
in the principality of Culmbach; 7 miles E. of Bayreuth.

RADES, a town of Tunis, on the N.E. coast; 5 miles
S.E. of Tunis.

RADESHE, or Radeschach, a town of Lower
Carniola, on the Save; 10 miles N.W. of Gurkfeld.

RADHA, in Mythology, is the name of the comfort of
the Hindoo deity Krishna. As Krishna was an avatar,
or incarnation of Vishnu, fo Radha is understood to be similarly
an avatar of Vishnu's consort Lakshmi; thus incarnated
to accompany her lord in this, his most splendid terrestrial
manifestation. Under the articles KRISHNA and LAKSHI-
MMA some notice will be found on the subject of this. Radha is seen
very frequently portrayed and alluded to in the paintings
and writings of India: Krishna is, indeed, seldom seen with-
out her. She is represented of perfect beauty, and is warmly
cherished in the amatory poems of Hindoostan. In the
elegant work of Jayadeva, entitled Gita Govinda, a pastoral
play exhibiting the loves of Krishna and Radha, the lovely
nymph is thus described after a quarrel with her frolicksome
and licentious, in the morning after the night of reconcili-
ation, when affection confounded, and ecstacy crowned the recondi-
tion of past sorrows. "In the morning the arrow, dis-
arrayed, and her eyes betrayed a night without slumber,
when the yellow-robed god, who gazed on her with trans-
port, thus, in his heavenly mind, meditated on her charms:
'Though her locks be diffused at random; though the lustre
of her lips be faded; though her garland and zone be fallen
from their enchanting stations; and though she hides their
places with her hands, looking towards me with bashful
silence; yet, even thus disarrayed, she fills me with ecstatic
delight.' But Radha, preparing to array herself before the
company of nymphs could see her confusion, fpoke thus with
exultation to her obsequious lover.

'Place, O fon of Yadu! with fingers cooler than sandal
wood, place a circlet of musk on this breast, which resem-
bles a vase of consecrated water, crowned with fresh leaves,
and fixed near a vernal bowier to propitiate the god of love.
Place, my darling! The glossy powder, which would make
the blackest bee envious, on this eye, whose glances are
keener than arrows darted by the husband of Reti. (See
Reti.) Fix, O accomplished youth! the two gems,
which form part of love's chain, in these ears, whence the
antelopes of thine eyes may run downwards and sport at
pleasure. Place now a fresh circlet of musk, black as the
lunar spot, on the moon of my forehead; and mix gay
flowers: on my trefoles with peacock's feathers, in graceful
order, that they may wave like the banners of Kama. Now
replace, O tender hearted! the loofe ornaments of my
vulture; and reft the golden bells of my girdle on their
defined flation, which resemles those hills where the god
with five fhafts, who destroyed Sambara, keeps his elephant
ready for battle.' While he fpoke, the heart of Yadava
triumphed; and obeying her ipportive behalfs, he placed
musk fpot on her bosom and forehead; dyed her temples
with radiant hues: embellifhed her eyes with additional
blackness; decked her braided hair, and her neck,
with fresh garlands; and tied on her wrists the loofened bracelets,
on her ankles the beany rings, and round her waift the zone
of bells, that founded with ravifhing melody.'

But we must recollect, says the author of the Hindu
Pantheon, whence this article is chiefly taken, that the
feemingly amorous conflicts of these ardent lovers are mere
mythical descriptions of "the reciprocal attraction between
the divine goodnefs and the human foul." This is the
emblematical theology that Pythagoras admired and adopted;
that the Sufi poets, Hafez, Sadi, and many others among the
Perfians, and Solomon also, in his fine Song, fo beauti-
fully inculcates. Like the enthusiasts of other days, and
in a manner not easily comprehended by the unenlightened,
 nor believed by them to be permanently chafte, however in-
nocent its commencement, "they profess eager defire, but
without carnal affection; and circulate the cup, but no
material goblet: in their feft, all things are spiritual, all is
mystery within mystery." See fir W. Jones's admirable
Eflay on the Mythical Poetry of the Persians and Hindoos,
in the third volume of the Aflatic Researches, in which a
translation of the Gita Govinda of Jayadeva is introduced.
Under the article JAYADEVA of this work is a brief notice
of his poem; and under MAHES is an extract from it,
descriptive of the persons and loves of this interesting
couple. (See alfo PRABHA.) The reader delirious of
feeling what has been faid and believed on the curious
funjet of mythical or emblematical theology, may confult
our articles under MYSTERY, MYSTICS, and those thence
referred to.

Returning to Radha, we have to observe that among the
feft of Gokalaththa (see Sects of Hindoo) she is deemed a
personification of religion, and sometimes called Radhemi.
(See that article.) There is a sect said to worship her exclusively, and called Radha-balabhah; they consider her as the Sakti, or active power of Viṣṇu or Kṛṣṇa. (See Sakti.) The followers of this sect have attributed to them the singular practice of waking their own wives perfornate Radha, and of presenting to or through them the oblations propitiating the goddesfs, or Lakṣmī, of whom, as before said, she is an incarnation. There is no end to the whim- sicalities in the modes of human worship, to give them no harsher name, wherever, to use an oriental expression, we suffer our necks to slip out of the collar of reafon. Thus in India, as hath been the case in other countries, there is, with several sects, a right-handed and a left-handed mode of worship; one meaning a decent, the other an indecent mode. Thofe among the fools in question, who follow the left- handed path, require their wives to be naked, when attending them at their devotional abominations. She is sometimes called Radhika, and Kṛṣṇa, Radhikēsvara, or lord of Radhika; and sometimes the name of Kantamati is given both to her and Rukmēni. See Rukmēni and Yonī.

In Radha may be recognized the Grecian Juno, and of course in her husband Kṛṣṇa, or Viṣṇu, the amorous Jove of that imitative race. On this point we shall quote a paragraph from the Edinburgh Review, N° xxxiv.

"We translate a paflage from the Purana, entitled Brahma Vaivartica, to demonstrate the identity of character ascribed to Jupiter and Viṣṇu; only remarking, that in conformity to the peculiar tenets of its author, Viṣṇu is here filed Kṛṣṇa, and his godfesfs, Rādhā. Gangī (the Gangs) was originally a nymph of wonderful beauty, who inhabited Paradise. She became enamoured of Kṛṣṇa, and, concealing her face with her robe,浮动 immovable in his presence, her eyes fixed on his radiant countenance. The jealousy of Rādhā (Juno) was excited. Followed by her innumerable attendants, she repaired to the presence of the god, and sate herself on her throne of gems. The timid Gangī trembled at her aspect, and disfoved with terror. The godfesfs speak: "Who is this nymph, lord of the uni- vers, who, with half concealed visage, and eyes sparkling defire, thus gazes on thy faced person? This is not the first time the fifies have witneffed the infulence of their lord. When I detected thee dwelling in a grove of fandal with Vi- raja, the figure of a quadraped concealed thy fame, and she was changed into a river. Still purfued by thee became the mother of the mighty ocean. The fame fooriant was the fonce of thy fumors with the nymph Sūkhī, (beauty). Again thou aflumed the form of an animal; whilst her spirit fled to the moon, and thou difputed her body amongst gems, flowers, and black-eyed damafs. The woods of Vrindavan afford thee a retreat with the shepherdfes Prabhā (Jufer). On my arrival, her spirit tranfmiagrated to the solar orb; of her body thou madeft a distribution; the god of fire obtained a part; and fome, as gold, give brightnesfs to the crowns of the kings of the earth. When I found thee, unexpectedly, on a bed of veraf buds, reclined in company with the fair Xami (patience), alarmed at my voice, thou gatheredft as they lay defperfed, thy yellow robes, thy lyres, thy neckfafe of flowers, and thy creaf of gems. Thee I forgave when thou befpeafed a portion of her body on the pious anchoret, a portion on the fielk, and a portion on the fudius."

Such of our readers as have obtained a share in the latter portion, may, in the endeavour to expound this folar allegfry, be repaid perhaps for their pains; in perufing the Gita Govinda and the article in which it is compiled, above referred to, they affuredly will.

RADHIKA, a name of Radha, confort of the Hin- deo deity Kṛṣṇa, as sufficiently noticed under those articles.

RADHOST, in Geography, a mountain of Moravia, in the circle of Prerov; 12 miles E. of Meferitch.

RADHUA, a mountain of Arabia; 30 miles W. of Medina.

RADIÆUS, in Anatomy, an epithet applied to parts about the radius, and equivalent to radiusis; which fee.

RADIAL CURVES. See CURVES.

RADIALIS, in Anatomy, a name given to parts in the foarc-arm, situated near the radius. The adjective radial is also employed to denote the edge, surface, or aspect of any part, which is towards the radius; and in this way, with the term ulnar, affords the means of describing the organs much more accurately and intelligibly, than the indefinite exprefions of outer and inner, which vary constantly in the changing attitudes of the limb.

RADIALIS Arteris, is the artery of the wrist, in which the pulse is commonly felt. See ARTERY.

RADIALIS Carpi Extensor, Longior & Brevior. See CARPI.

RADIALIS Carpi Flexor. See CARPI.

RADIALIS Extensoris, Longior & Brevior, fynonym of the extenfoes carpi radiales, longior & brevier. See CARPI.

RADIALIS Internus, a fynonym of the flexor carpi radi- alis. See CARPI.

RADIALIS Nervus. The large nerve which goes behind the humerus, between two heads of the triceps, is called radial by some anatomists: others give this name to the nerve which lies parallel to and over the brachial artery. The frift of these is called also the muscular spiral nerve, the second the median. See NERVE.

RADIALIS Vena, the vein correfponding to the radial artery. See VEIN.

RADIANT Heat. See HEAT.

RADIANT Point, or Radiating Point, is any point of a visible object, whence rays proceed. Every radiant point diftributes innumerable rays all round; but only those radiants are visible, from which right lines may be drawn to the pupil; because the rays are all right lines.

All the rays proceeding from the fame radiant continually diverge; the crystalline collects or reunites them again.

RADIATED, in Botany, an epithet applied to round flat flowers, confluencing of a disk, and a fingle row of longifh pointed leaves, ranged all around it in manner of rays, or fpoifes.

Radiated flowers are properly fuch as have several femi- foliacs fet round a disk, fo as to refeemble a radiant ftar; fuch are daffies, chamomile-flowers, ran-flowers, &c. These are sometimes also called radiated diffuses flowers.

A radiated flower has two parts; its middle part, which is called the disk, and which is wholly made up of foliacs; and the other part, which is called the circle or border, which is wholly made up of semi-foliacs, or elle of plain flat leaves; but that is left common. The foliacs and semi-foliacs both usually adhere to the embryos, and to the thalamus of the flower, being contained in one general cup. These embryos finally ripen into seeds; sometimes furnished with down, sometimes with foliaceous heads, and sometimes without either, and sometimes margined. Of these seeds some are wrapped round with a kind of cafe or capfuie, others are separated from one another by small perpendi- cular leaves.

RADIATED Leaf. See LEAF.

The word is also used in speaking of medals, and in heraldry,
RAD

eraldry, where the ancient crowns are called radiated
crowns, corona radiatae. See Crown.

RADIATION, in Physics, the action of a body diffusing
rays of light as from a centre.

Every visible body is a radiating body; it being only by
means of its rays that it affects the eye.

The surface of a radiating body may be conceived as
consisting of radiant points.

Radiation, Place of. See PLACE.

Radiation, or Irradiation, is also used by some authors
to express the manner of the motion of the animal spirits;
on a supposition that they are diffused from the brain
towards all parts of the body, through the little canals of
the nerves, as light is from a lucid body. But in lieu of a
radiation, the moderns rather incline to the opinion of the
circulation of the spirits.

RADICAL, Radicis, in Physics, &c., something serv-
ing as a basis or foundation; or which, like a root, is the
foure or principle whence any thing arizes.

The schools talk much of a radical moisture inherent in
the feeds of all animals, which nourishes and preserves the
vital heat or flame, as oil does a lamp; and which, when
exhausted, life is extinguished.

Dr. Quincy observes, that this radical moisture is a mere
chimera; unless we thereby mean the mafs of blood, which
is the promptuary whence all the other juices and humoura
are derived; and which, while it circulates, sustains life, &c.

In grammar, we use the term, radical words, for roots
and primitives; in opposition to compounds and derivatives.
In the Hebrew language, the letters of the alphabet are
divided into radical and fervile. The first constitute
primitive or original words, which, by a significant metaphor,
ard called roots, מ radix. All the 22 letters of
the alphabet may be radicals; i.e., primitive words may consist
of any of these letters; but the following 11 letters properly
claim this title, because they can never be ferviles: aleph. gimel. mem.

Whichever letters any word contains, it must at least contain one of a
radical character. (See Root.) For an account of the
fervile letters, see SERVIL.

Radical Numbers, Numeri Radicales, in the Italian mufic,
are 2, 3, 5, 7, 8, 9, and sometimes 10, which are often
met with in musical compositions, to denote the acores of
the thorough basses; 2 stands for the second and its duplica
3 for the third; 4 for the fourth, &c.

Radical Life, among Botanists. See LEAF.

Radical Sign, in Algebra, the sign or character of the
root of a quantity.

\( \sqrt[n]{x} \) is the character of radicality, and expresses the square
root of a

Radicans, in Botany, rooting, a term applied to a
plant which throws out fibres as it extends itself; whether
these fibres be true radicles, by which the plant imbibes
nourishment, and is generally increased; or whether
they serve only for the support of the stem against walls, rocks,
or neighbouring trees. Of the first kind, the Strawberry
affords a familiar example; of the latter, the Ivy, the Vir-
ginian Creeper (Hedera, or rather Fitis, quinquifolia), and the
Bignonia radicans, are instances.

Radication, the action by which plants take root,
or flourishes.

The French Royal Academy of Sciences have made a
great number of curious observations on the germination
and radication of plants.

Radicle, in Agriculture, that part of the seeds of
plants which, upon vegetating, becomes their naifest roots.

It is, in fact, the main organ or medium of nutrition, and
the means by which food is imbibed or drank up from the
surrounding soil or earth. The radicles, together with the
leaves, therefore, constitute the absorbent organ of plants.
See RADICULA, and Root.

Radicofani, in Geography, a town of Etruria, near
which are two castles, one built by Didier, last king of the
Lombards, and the other by Colmo I.; 55 miles S. of
Florence.

Radicondoli, a town of Etruria; 24 miles N.E.
of Florence.

Radicula, in Botany and Vegetable Physiology, the
radicle, or fibre of the root. (See Root.) This term is
used by Dillenius, in his Nova Genera, 121. t. 6, as a
generic name, for a set of plants referred by Linneas to
Sisymbrium. See that article.

Radii Pronator Quadratus, in Anatomy, a muscle of the
fore-arm. See PRONATOR.

Radii Pronator Teres. See PRONATOR.

Radii Supinator Brevis, 4 muscles of the fore-arm. See
Radii Supinator Longus, 1 Supinator.

Modinaeum, in Ichthyology, the little slender bones
supporting the membrane, forming the fins in fishes, and
called by Artedi officia radiata pinnatum, from their run-
ing from the base to the summit in the form of rays. See
FISH, and ANATOMY OF FISH.

Radium, in Geography. See RADUNP.OUR.

Radiolus, in Botany, so called by Dillenius, because
the cells of the ripe capsule spread like the rays of a little
wheel. The plant having been referred by Linneas to the
genus Linum, the above became its specific name; but it is
now restored to the rank of a genus by the late professor
Gmelin of Gottingen, as well as by the author of Flora
Sibth. v. 1. 110. Att. Hort. Kew. v. 1. 282.—Clas and
Caryophyllaceae, Juff.

Gen. Ch. Col. Perianth inferior, of one leaf, cut about
half down into four equal, permanent, wedge-shaped segments,
each of which is three-cleft. Cor. Petals four, obovate,
about the length of the calyx, alternate, with its principal
segments. Stam. Filaments four, oval-shaped, erect, the
length of the calyx; anthers roundish, of two lobes. Pet.
Germen superior, roundish, with four grooves; styles four,
terminal, very short; stigma capitate. Peric. Capsule
roundish, bluntly five-sided, of eight cells and eight valves.
Seeds solitary, elliptical, compressed, very smooth.

El. Ch. Calyx in many segments. Petals four. Cap-
ulus superior, with eight valves and eight cells. Seeds
solitary.

t. 893. (R vulgaris fernyphilosa; Dill. in Rari Syn. 345.
t. 15. f. 3. Jacob. Faverh. 92. Linnum Radiola; Linn.
Sp. Pl. 402. Fl. Dan. t. 178. Linnarcarpus Serpifolia, filo,
multicául, et multiovulórum; Mich. Gen. 23. t. 21. Mille-
greana minima; Rari Syn. ed. 2. 207. Ger. Em. 569.
Chamadileum vulgar; Vaill. Paris. t. 4. f. 6,)—Native
of sandy ground, overflowed by clean fresh water, throughout
Europe, flowering in July and August; not a very general
English plant. The root is annual, small, and
thick. Show an inch or two high, repeatedly forked,
corymbose, spreading, leafy, round, nearly smooth, many-
flowered, often reddish. Leaves opposite, pelliform, oval,
entire, smooth, nearly a quarter of an inch long.
Flowers small, white, on short, simple, solitary stalks from the
forks of the stem.—Gmelin has erred considerably in

the
the generic character and name, as well as in his reference to Linnaeus. The calyx is many-cleft, not composed of four distinct leaves; the plant has hardly any thing of the aspect of a Linum, and therefore cannot properly be called linsides; neither has it been published as a genus, under the name of Radiola, by Linnaeus, as Gmelin’s reference to the 12th edition of Syll. Nat. indicates.

**RADIOMETER**, a name which some writers give to the radius afronumicis, or Jacob’s staff. See *FORE-STAFF*.

**RADIIS, in Botany.** (See *Raphanus*.) The radish is much grown, according to the author of the Agricultural Survey of the County of Kent, on the belt rich loamy soils of the Isle of Thanet, and in East Kent, for the supply of the London feedmen. The roots usually cultivated for this use are, the early short top, the salmon, and the turnip-rooted radish.

The land for the growth of this sort of crop should be in a fine state of preparation, by being ploughed to a great depth in the early part of the winter, and broken well down by harrowing, so as to render it perfectly clean from weeds, being previously filled with well reduced manure. The ground being brought into this fine condition, the feed is down on furrows about ten inches apart, in a dry time in the month of March, about two or three gallons per acre. And as soon as the plants appear, every other row is cut up with a horse-hoe, leaving the rows twenty inches apart. When the plants get two or three rough leaves, they are hoed out in rows, and are then kept clean by repeated horse and hand-hoeing, when necessary, leaving the plants at about eighteen inches distance. It is added, in the above Report, that the crop is seldom fit to reap till October, and sometimes is out in the fields till Christmas, without receiving injury from wet weather; it being necessary that it should have much rain to rot the pods, that it may thrash well. In respect to the produce, it is from eight to twenty-four bushels per acre; and it is sold to the London feedmen, who feed it to all parts of the kingdom for retailing to the gardeners.

It is probable that this sort of crop might be grown in many other districts near the metropolis, or other large towns, with equal success, where the soil is of a rich loamy nature, as it is very cafe in its culture, and requires but little labour or trouble. As it is necessary for it to remain out such a length of time, however, it will be proper, especially in wet seasons, to keep the stems from falling over too much upon the ground, as they and the feed may be injured by being too much in contact with it. If kept up in this way, the stalks, feed-hulks, and other offal parts, may also form a good cut food for some sorts of live-flock, as is the case with some other similar sorts of crops.

**RADIIS, Horse.** See *COCHLILLARIA ARMENACIA*.

**RADIUS, in Anatomy,** that bone of the fore-arm which extends from the humerus to the wrist, in the line carried from the external condyle of the former bone to the thumb. See *EXTREMITIES*.

**RADIUS, Dislocations and Fractures of.** See *FRACTURE AND LuxATION*.

**RADIUS, in Botany and Vegetable Physiology,** means the aggregate marginal florets of compound flowers, each generally of an oblong form, and all spreading from the centre, or disk, like rays. Such are the white florets of the Daisy, and blue, purple or red ones, for the most part, of the *Aster*. The usual shape of the limb or border of such florets is ligulate; either linear, or elliptical; rarely, as in *Achillea*, short and roundish; the extremity having three or five teeth. In some compound flowers the radius consists of tubular florets, as in *Centaurea*; and those are matter, dislocate of organs of fructification. The ligulate radiant florets above-mentioned are either female, producing perfect seed; or they are abortive, with more or less imperfect traces of a pistil. Many of them have no sign of a stamen or stigma, but none is without so much of a germen, as serves for the basis, that supports the petal itself.

A radius is occasionally allured by some flowers, naturally delticute of one, as in the genus *Bidens*, each species of which, by such an acquisition, becomes a *Coreopsis*, and changes its order in the *Sympetra*, from *Polygama aquaticus*, to *P. Fupera*.* This is a change in an approach to a double flower, in that class; being a transformation of a certain number of the perfect, or united, florets into female ones. If such a transformation be total, and all the tubular florets become ligulate, the whole flower is double, and unproductive of feed, like the double Chamomile.

**RADIUS, Ray, in Geometry,** the semidiameter of a circle; or a right line drawn from the centre to the circumference.

The word is derived from the Greek ῥάβδος, rod. Fleta uses the word radius, for a furrow.

The radius is also called, especially in trigonometry, *radius tatus*; the whole fine.

It is implied in the definition of a circle, and it is apparent from its construction, that all the radii of the same circle are equal.

**RADIUS, in the Higher Geome try, Radius of the evolute, *Radius curvilineus, or Radius of the circle,* called also the radius of concavity and the radius of curvature, is a right line representing a thread, by whose evolution from off the curve on which it was wound, the curve is formed; or it is the radius of a curve that has the same curvature in a given point of a curve with that of the curve in that point. See *CURVATURE AND Evolute*, under which articles the method of finding this radius may be seen.

**RADIUS Afronumicis, an instrument usually called Jacob’s staff, the cross-staff, or fore-staff.**

**RADIUS, in Optics.** See *RAY*.

**RADIUS, in Mechanics,* is applied to the spokes of a wheel; because lifting like rays from its center.

**RADIUS Vector, is also used for a right line drawn from the centre of force in any curve in which a body is sup- posed to move by a centripetal force, to that point of the curve where the body is supposed to be. See *CENTRAL Force*.

**RADIUS, among the Romans, a name given to the iron rod with which the boys rolled the trochus.**

**RADIUS Articulatus, in Natural History,** a name given by Mellius, Gmelin, and some other authors, to a kind of figured foils, of which there are a great many very different species, some of which have been described by authors among the belemnites, under the names of alveolii belemnitarum. Mr. Gmelin, who has taken great pains to inform himself, as well of the nature and figure of these foils, from the subjects themselves, as of their history, and the various accounts of them from other authors, observes, that the place where they are most frequent is Sweden, and that there they are no where so common as in the isle of Oeland. Volkman figures some also which he found in Silesia, and Helwing others which he collected in Pruffia: he also found great numbers of them himself in Ruflia.

They are usually immersed in lime-kerne, and though at first sight they may all appear alike, yet, on a careful examination, they will be found to differ very greatly. The most obvious general distinction, established by Gmelin, is that some of them are straight, and others crooked. The straight ones may be divided into two genera. The first of these comprehends, according to this gentleman, two pecks; the first smooth, and with a converging alveolus. The
The regular and nice configuration of these bodies shews very plainly that they cannot be of mineral origin; but the several patellae of which each is composed, the fiphunculus of communication, obvious in several, and the shelly matter yet found remaining on many, prove them to have been once shell-fish of the univalve or tubular concamerated kind; the description of which, so far as it can be gathered from these remains, must have been this. The shell must have been either cylindric or conic in figure, of a smooth surface, and divided into several chambers or cells; but this for that the septa which form the concamerations are not continued and whole, but in some part of the periphery are cut in, in the shape of a crescent. Through these crescents, which, standing all together, make a continued canal, there has paled another shelly body of a cylindric or conic figure, also divided into concamerations, and that in such a manner, that the septa which form the cells are pierced with a small aperture on one side, which grows gradually smaller as the shell extends in length; and finally, through these apertures, in the concamerations, there pales another shell pointed at the end, and, like the rest, divided into its concamerations, and pierces along its middle with a fiphunculus.

Mem. Acad. Petrov. vol. iii. p. 263.

This shell is, therefore, a compage of three shelly bodies, enclosed one within another; and, it must be supposed, in order to carry an analogy with other shell-fish, these three shelly bodies have communication with one another, by means of certain flaps or perforations. The communication of these, one with another, seems all evident, from their being all found in their foffile state, filled with the same fomy matter; this, has, doubtless, been all received in at the fiphunculus of the inner shell, and thence has been thrown into the second, and from this into the third shell, so as to fill up all the concamerations of the outer, as well as of the inner parts. This must have been the case with these; and the several various species that are at this day found foffile, must have owed their origin to as many different species of the shells. The crooked and twisted, or wreathed kinds, which have the fiphunculus usually placed near the side, greatly approach in their structure to some of the corn ammon.

RADIX, in Botany and Vegetable Physiology. See Root.

RADIX, in Radical and Root.

RADIX, among Grammarians. See Radical, and Root. See Radical, and Root.

RADIX, in Mathematics, the same as root; but used in a different sense by different authors: we say the root of an equation, but the radix of a fyltem, the radix of a series, the radix of notation, &c. meaning in all these cases the fundamental quantity on which the fyltem is constructed, or that whence it has been derived, or that by means of which all other things of a like kind are compared.

RADIX of a System of Logarithms, is that number which is involved to the power denoted by the logarithm, is equal to that number. Thus, under the article Logarithms it is shown, that if \( r^a = a \), then \( x \) is the logarithm of \( a \), and \( r \) is called the radix of the fyltem. This radix in the common or Briggs's logarithms, is 10, and in the Neperian or hyperbolic logarithms, it is 2.71828128, &c. and generally the radix of any fyltem of logarithms, is that number whose logarithm in that fyltem is unity.

RADIX of a System of Notation, is that number which indicates the local value of the figures, and is in all fyltems represented by a unit and cipher (10), which is ten in the common fyltem, two in the binary fyltem, three in the ternary, twelve in the duodenary, and so on. See Notation.

RADIX of a Series is used, by some authors, as a term of comparison between any finite function, and its expansion or development: thus, the radix

\[
\text{of } 1 - r + r^2 - r^3 + r^4 \quad \&c. \text{ is } \frac{1}{1 + r} \\
\text{of } 1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} \quad \&c. \text{ is } \frac{1}{1 + \frac{1}{2}} \\
\text{of } 1 - 1 + 1 - 1 + 1 \quad \&c. \text{ is } \frac{1}{1 + 1} \\
\text{of } 1 - 2 + 4 - 8 + 16 \quad \&c. \text{ is } \frac{1}{2 + 1} \\
\text{of } 1 + n + n^2 + n^3 + n^4 \quad \&c. \text{ is } \frac{1}{1 + n}
\]
RAD

of \(1 + 2x + 3x^3 + 4x^4 + 5x^5 \) &c. is \(\frac{1}{1-x}\)

of \(1 + \frac{x^3}{2} + \frac{3x^4}{8} + \frac{5x^5}{16} + \) &c. \(\sqrt{\frac{1}{1-x}}\)

See Dr. Hutton's Tracts, vol. i. p. 9. See also our article Series.

RAD-KNIGHTS. See REDMANS.

RADL, in Geography, a mountain of Stria; eight miles S.S.W. of Landiper.

RADLER, in Geography, a mountain of Saxenburg.

RADLESTEIN, a town of the duchy of Carnol; six miles W. of Landihof.

RADLESTHAL, a town of Aftria; nine miles E. of Krottau.

RADMANS. See REDMANS.

RADMANSO, in Geography, a small island in the Baltic, near the coast of Sweden. N. lat. 59° 45'. E. long. 18° 44'.

RADNAGUR, a town of Bengal; 32 miles S. of Burdwan.

RADNITZ, a town of Bohemia, in the circle of Pilfen; 10 miles N. of Pilfen.

RADNOR, New, or Mass-y-Feid, a borough and market-town in the county of Radnor, South Wales, is situated near the river Somer-

gill, at the distance of seven miles N.W. from Kington, and 156 miles N.W. from London. In remote times, this town was

a place of great importance, as appears from its having given name to the county, but it has now dwindled into comparative

departure and insignificance. Caradog informs us, that about the year 990, Meredith ab Owain destroyed Radnor, in a ferocious

temple with his nephew, who had been afflicting the English to ravage South Wales. It recovered, however, from this disaster,

and continued to flourish till the union of Wales with England, when it began to decline, in consequence of its ceasing to be

fortified and garrisoned as a frontier town. Before that period, it was surrounded by a lofty wall, and a deep moat, some remains

of which are distinctly visible on the west and south sides. The walls, when standing, are traditionally said to have been of

great height. The area inclosed by them was an oblong square, containing about twenty-six acres of ground, laid out into three longitudinal

streets, which were intersected by five tranverse ones. Of these at present several have no buildings; and others are only foot paths. But though

thus decayed, Radnor still preserves its privileges as a borough. The corporation consists of a bailiff, twenty-five

capital burgesses, two aldermen, a recorder, a coroner, a town-clerk, and other inferior officers. The bailiff and

aldermen are chosen annually from among the capital burgesses, and are justices of the peace. The bailiff of the preceding

year is also a justice of the peace; and there are besides three additional persons nominated out of the capital burgesses, who are

invited with similar authority. The district over which they preside, and supercede the jurisdiction of the county magistrates, is considerable; comprehen

sively a circle round the town nearly ten miles in diameter. The bailiff's courts and the petty seions are regularly held every Monday, when the bailiff, aldermen, and town-clerk attend to transact business relating to the borough, and have power to determine all suits for sums under forty shillings. The quarter-seions for the borough are held on the Mondays after the county quarter-seions at Prestige; and the sheriff's county courts for the recovery of small debts, are

held every alternate month here, and at the town last mentioned. The representative for the borough is chosen by the burgesses of New Radnor, in conjunction with those of the boroughs of Knighton, Rhaiadar, Cefn Llys, and Cwncelas; the bailiff being the returning officer. As nothing but the circumstance of receiving parochial relief disqualifies any person from becoming a burgess, the number of voters is considerable; those of New Radnor are supposed to exceed 300, and the whole number, including those of the contributory boroughs, is estimated to be about 1500. To be a capital burgess of New Radnor, however, actual residence within the jurisdiction is essential, which is not the case as to the contributory boroughs: and if a capital burgess becomes non-resident he loses his privileges as such. A benefic society, established here in 1778, at present consists of above 100 members, who hold their annual meetings on the 6th of January.

Weekly markets were formerly held here on Tuesdays, but these are at present, only nominal, notwithstanding some late attempts to restore them. There are still, however, five annual fairs; and there is also an annual wake on the third Sunday in the month of August. The parish of Radnor is divided into three portions, of which the town of New Radnor is the principal, containing, according to the parliamentary returns of 1811, 75 houses, and 360 inhabitants. The public buildings here are the town-hall, the prison, and the church. The last consists of a nave, south aisle, and chancel, with a tower at the west end.

Radnor castle stood on an eminence commanding the town. Of this once majestic pile, a few fragments of walls only remain, but the entrenchments are still entire; the outer ward, called Baili-Glas, or the Green Court-Yard, is yet distinct from the inner one, or keep, and is nearly in its original form. In 1773, on digging within the area of this castle, fix or seven small "Gothic arches of good masonry were discovered," besides a variety of ancient inscriptions. The forest of Radnor extends several miles to the north of the town, covering the slope of a lofty eminence, from the summit of which are very extensive prospects. The principal seats in the vicinity are Downton-hall, the seat of Percival Lewis, esq.; and Harpton-court, a seat belonging to Thomas Frankland Lewis, esq. Both these mansions are surrounded by beautiful scenery, and are highly ornamental to this district. About two miles westward from the town is a celebrated water-fall, called Waters-break its-neck, seventy feet in perpendicular height; but it is extremely defective in water, except during the time of floods, when the effect produced is truly grand. At the western extremity of the parish is an intrenched dyke, which formerly extended across the whole vale of Radnor. War-closte, a field to the eastward of the town, is traditionally said to have been the scene of some military contests, but no particulars respecting it are preserved.

Old Radnor, or Pen-y-Graig, is a small village, situated about three miles to the south of New Radnor. Camden supposes it to have been the Magnos of Antoninus, which was garrisoned by the Phcenician regiment in the reign of Theodosius the younger; and there seems every reason to believe that it was a place of note in the Romo-British period. The Roman road passed cloote to the base of the hill upon which the village stands. The church here is a venerable old edifice of stone, with a massive square tower at one end. A curious screen, richly carved in wood, extends across the nave and side aisles. Here are various monuments to the memory of members of the Lewis family of Harpton. Carlile's Topographical Dictionary of Wales, 4to. 1813. Lipcomb's Tour through Wales.
RAD

RADNOR, a small pleasant town of America, in Delaware county, Pennsylvania. The place was originally called "Amstel" by the Dutch, who began to build here. The number of inhabitants is 925.

RADNOR, a town of South Carolina; 10 miles S.W. of Edmondbury.

RADNORSHIRE, an inland county of South Wales, is bounded on the north by the counties of Montgomery and Salop, on the east by the county of Hereford, and on the south and west by the counties of Brecknock and Cardigan. According to Mr. Clark, it contains 510 square miles, or 346,000 acres, and is politically divided into five hundreds, and fifty parishes; some of which are within the diocese of Hereford, and the remainder within that of St. David's. The parliamentary returns of 1811, state the number of its houses at 4,914, and of its inhabitants at 20,900. It sends two members to parliament; one for the county, and one for the borough of New Radnor, with its contributory boroughs. The face of the country is extremely mountainous and bleak in every part of it, but it is interlaced by several valleys, which are watered by the Wye, the Teme, the Lugg, the Teme, and the Eddow, and their respective fertile and arable tracts. These valleys afford a considerable extent both of meadow and arable land; especially the Vale of Wye-Side, and the Vale of Radnor, some portions of which are very fertile, and have a good soil and a congenial climate. In the other parts of the county, being a barren soil, and a chilly atmosphere, are the predominant characteristics. Nearly two-thirds of its whole extent being either in a state of commonage, or lying wholly waste, agriculture has hitherto made little comparative progress here. Cattle and sheep consequently constitute the chief produce of the county. The number of the latter is indeed very great. Hence Radnorshire is famed for its supply of wool; but notwithstanding this circumstance, singular to say, the manufacture of woolen goods is totally disregraded. The raw material is sold to the manufacturers of the north, by whom the inhabitants of this county are in return furnished with cloth.

Radnorshire contains three market-towns; Presteigne, Rhaiadar, and New-Radnor. The market at the last, however, is only nominal. The county courts are held at Presteigne, which is now the most important and flourishing town in the county. (See Presteigne.) The chief remain of antiquity within its limits is Offa's Dyke, which commencing at the river Wye, near Hay, skirts the counties of Radnor and Hereford, and falls into Montgomeryshire at Pwll-y-Pyd, a hamlet on the road between Bishops-castle and Newtown. The only religious house in the county was the abbey of Cwm Hir, founded in 1143, for monks of the Cistercian order, by Cadwathelain-ap-Madoc, who, at the dissolution, was valued at 28l. 17s. 4d. per annum. Of this monastery a considerable part of the buildings is yet standing, though in a very ruinous and dilapidated condition. Leland, in his itinerary, (vol. v. p. 141.) speaks of its church as the longest in Wales, and informs us, that it was "spoiled and defaced by Owen Glendower." The principal castles in Radnorshire were those of Colewine, Tynboni, Aberedow or Aber-Edwy, Ewennil, Radnor, Rhaiadar, and Pain's-castle. Several antiquaries, among whom are Camden, Gale, and Ward, place the Roman station Magns, or Magna, at Old Radnor, as it is mentioned above; but Baxter contends that it should be fixed at Ledbury, in Herefordshire, and Harris at Gaer, near Brecknock. In this county, particularly on the summit of Gwafoddin hill, are several of those collections of stones called in South Wales karnew, in North Wales, karnew, in Scotland, carius, and in Ireland, duine.

RAF

Radnor was erected into an earldom by Charles II., in the person of John Roberts, lord Roberts of Truro, but that title became extinct in 1757. It was revived, however, in 1705, in the person of William Bourerie, baron Longford, and viscount Folkestone, whose son Jacob, now earl of Radnor, enjoys his privileges. General View of the Agriculture of the County of Radnor, by John Clark, 4to. Skrine's Tours in Wales. Camden's Britannia. Pennant's Tour in Wales, 8vo.

RADNOTH, a town of Transylvania, on the river Maros; 32 miles W. of Szeberv.

RADOE, a small island in the North Sea, near the coast of Norway. N. lat. 65° 35'.

RADOFFIN, a town of Moravia, in the circle of Iglau; 21 miles E. of Iglau.

RADOLFZELL, or Radeszell, or Zell, a town of Germany, in Aultrian Swabia; situated on the Untersee, or lake of Lille; 10 miles N.W. of Constance.

RADOM, a town of Poland, in the palatinate of Sandomire; 30 miles N.W. of Sandomire.

RADISH, a town of Bohemia, in the circle of Prachatitz; founded by N. of Strakomitz.

RADOMISL, a town of Poland, in the palatinate of Lublin; 45 miles S. of Lublin.—Allo, a town of Poland, in the palatinate of Kiev; 36 miles N.W. of Kiev.

RADOMSK, or Radomski, a town of Poland, in the palatinate of Sisdia; 32 miles E. of Sirdia.

RADONITZ, a town of Bohemia, in the circle of Sätz; 13 miles W.S.W. of Sätz.

RADOSCHITSCH, a town of Poland, in the palatinate of Sandomire; 20 miles N.E. of Malogoz.

RADOS, a town of Prussia, in the palatinate of Culin; 10 miles W. of Lautenburg.

RADSTADT, a town of the archbishopric of Salzburg; 36 miles S.S.E. of Salzburg.

RÄDT vor dem Wald, a town of the duchy of Berg, where Roman Catholics, Lutherans, and Calvinists, have, each of them, a church; 25 miles E. of Daffeldorp.

RAJULA. See RASAIATORY.

RADUNPOUR, or Radimpoor, in Geography, a town of Hindooftan, in the county of Agimere, on the river Pudder, or Butlais; 171 miles N. of Surat. lat. 23° 58'.

RÄDZANOW, a town of the duchy of Warsaw; 30 miles N.E. of Ploceeko.

RÄDZIEZOW, a town of Poland, in the palatinate of Belez; 24 miles W. of Belez.

RÄDZIEJOW, or Ronschow, a town of Poland, in the palatinate of Breslum; 25 miles W. of Breslum.

RÄDZIVALNOW, a town of Lithuania; 50 miles E.N.E. of Minsk.

RÄDZIMIN, a town of the duchy of Warsaw; 12 miles N. of Warsaw.

RÄMSDORF, or Ramsdorff, a small but strong place of Brabant; three miles E. of Gertrudenberg.

RAEPOUR, a town of Hindooftan, in the circle of Goobud, on the Jumna; 38 miles E.N.E. of Lahaar.

RÄERDORP, a town of Holland; five miles N.E. of Amsterdum.

RÄTVIK, a calcareous mountain of Sweden, the height of which is estimated by Bergman at 6000 feet above the sea, observing also, as a singularity, that upon this mountain, and that of Rodberg, are found vast blocks of reddish felspar, mingled with quartz and brown mica.

RAFAEL, Cape, a cape on the E. coast of the island of Hifpaniola. N. lat. 19° 21'.

RAFAEL, St., a town of South America, in the province of
of Caraccas; 40 miles S. of Caraccas.—Also, a town of South America, in the province of Moxes; 210 miles E. of Santa Cruz de la Sierra la Nueva.—Also, a town of New Navarre; 105 miles S.W. of Cala Grande.

RAFH, a town of Egypt; 57 miles N.E. of Caiiec.

RAFALSO, a small island in the gulf of Finland. N. lat. 65° 29'. E. long. 26° 12'.

RAFAELLE DA URBINO, in Biography. See RAFFAELLE.

RAFFLING, a sort of game with three dice, in which he throws the greatest pair, or pair royal, in three casts; wins the prize or flake.

The word probably comes from the base Latin, risiflare, to risk, to hazard, take all away.

The raffle is properly the doublet or triplet; a raffle of aces, or duces, carries it against mere points.

RAFFLING is also used when a company of perfons club to the purchase of a commodity, or make small deposits, amounting in the whole to its full value; and he that throws the highest on three dice, or who has the highest number by means of balls thrown on a bagatelle or porto-bello table, takes it.

RAFICA, in Geography, a town of Asiatic Turkey, in the government of Diarbekir; three miles S. of Raca.

RAFLUNDA, a town of Sweden, in the province of Skone; 17 miles S. of Christianfadt.

RAFIA, in Botany, a genus of plants, separated from the Linnean Crotalaria and Liparia, augmented with several new species from the Cape, and named by its author, Professor Thunberg, in the second part of the preface to his Prodromus Plantarum Capetianum. De Theis is completely in the dark as to the person commemorated in this name, who can be no other than Mr. C. G. Rafin of Copenhagen, author of a Flora of Denmark and Holstein, in the Danish language, published in the years 1796 and 1800, in octavo, making two volumes, which include the first ten classes of the Linnean system. We know not whether any more has appeared. The name botanist has written a work on the physiology of plants; and several papers for the Academy of Sciences at Copenhagen. See Sims and König's Ann. of Bot. v. 1. 6.—Thunb. Prodr. 123. pref. n. 48. Willd. Sp. Pl. v. 3. 949. Ait. Hort. Kew. v. 4. 261.—Clas and order, Diadella Decandria. Nat. Ord. Papilionaceae, Linn. Leguminoseae, Jull.

Gen. Ch. Cal. Perianth inferior, of one leaf, bell-shaped, five-cleft, ringent; the upper lip in two broadish dilatant segments; lower divaricatet, in three acute ones, the middle one smalllet. Cor. Papilionaceous. Standard large, heart-shaped, acute, spreading, depressed at the base. Wings ovate, about half as long as the standard. Keel acute, the length of the wings. Stam. Filaments ten, all united into a linear tube, split along the base; five of them rather the throat; others simple. Pist. Germin filacted, linear; style simple, bent upwards at nearly a right angle; stigma obtuse. Peric. Legume filacted, oblong-lanceolate, compressed, of one cell and two valves. Seeds several, filacted, roundish-kidney-shaped.

Edl. Ch. Stamens all united. Calyx ringent; upper lip divided; lower divaricatet, in three segments, the middle one smalllet. Legume filacted, lanceolate, compressed.


1. R. amplexicaulis. Orbicular Rafina. Thunb. Prodr. 123. Willd. n. 2. (Crotalaria amplexicaulis; Linn. Sp. Pl. 1035. Genista perfusloata, orbiculatis folis; Schw. Theon. v. 1. t. 24. f. 5. Linn.)—Leaves reticulatet, orbicular, clasping the stem, alternate; the floral ones opposite, coloured.—Native of the Cape of Good Hope. A smooth, handsome, branched, racemose, clothed with entire leaves, from one to two inches across, finely reticulatet with innumerable veins; the upper ones, which accompany the flowers, smaller, and pale yellowish. Flowers solitary, nearly septic, smaller, than the floral leaves.

2. R. elliptica. Elliptical Rafina. Thunb. ibid. Willd. n. 3; excluding the reference to Andrews.—Leaves slightly veined, elliptic-ovate, acute, alternate; the floral ones opposite, not longer than the flowers.—Native of the Cape. Confounded by Linneus with the foregoing, from which it differs in having much smaller leaves, septic, not clasping the stem, quite different of reticulatet veins. Flowers of a deeper yellow, as long as the floral leaves.


4. R. triflora. Three-flowered Rafina. Thunb. ibid. Willd. n. 5; Ait. n. 1 Venten. Malm. t. 48. (Crotalaria triflora; Linn. Sp. Pl. 1004. Curt. Mag. t. 482. Borbonia cordata; Andr. Repof. t. 31, excluding the fynonym.)—Leaves ovate, smooth. Branches angular. Stalks single-flowered, three together.—Native of the Cape, where it was gathered by Sparrmann and Thunberg, and from whence its seeds were sent to King garden, in 1786, by Mr. Francis Maffon. The plant is biennial, requiring to be sheltered in winter, and flowering in June and July. Stem branched, about a yard high, most leafy in the upper part, smooth, and of a glaucous green, as well as the leaves, which are numerous, alternate, almost septic, more or less ovate, but varying in size and breadth. Flowers abundant at the summits of the branches, large, yellow, axillary, filacted, three together, the floral leaves smaller than the rest, and often tinged with purple.

5. R. opposita. Opposite-leaved Rafina. Thunb. ibid. Willd. n. 6. (Crotalaria opposita; Linn. Suppl. 322. Liparia opposita; Linn. Syll. Veg. ed. 13. 54. Spartium capenae; Sp. Pl. 995. Cytisus capenae; Berg. Cap. 217.)—Leaves elliptic-lanceolate; the upper ones mostly opposte. Flowers lateral, on short solitary stalks.—Native of the Cape, apparently unknown in our gardens. Linneus and his son confounded many different things under this species, some of which being marked in their herbarium as having been gathered by Thunberg, we presume to be among those to which he has defined; yet it is not possible to determine them all by his short characters, several of which unfortunately contradict the specific names. The stem of the present is described by the younger Linneus as simple, he considering as flower-stalks the copious, alternate, leafy branches, three or four inches long, on which one or two parts of the lower leaves are opoosite; the proper floral leaves, like those of the stem, being alternate; all the leaves are elliptic-lanceolate, or somewhat obovate, acute, entire, single-nerved, an inch or more in length. Flowers either lateral or axillary, among the uppermost leaves, solitary, each on a simple stalk about the length of its calyx. Corolla yellow, not half so large as the last species.

Leaves lanceolate, alternate or opposite. Flowers terminal."—This and all the following were gathered by prof. Thunberg, at the Cape. In the Linnaean herbarium is a specimen, by whom gathered does not appear, which seems to answer to the above character. (except the flowers being linear-lanceolate,) and which may perhaps explain the paradoxical contrariety between the specific name and character. In this specimen the flowers are really terminal, being foliatory at the ends of conspicuous, short, leafy, lateral branches, which are axillary. The whole plant has a Hytop-like aspect.


8. R. sphaerica. Spiked Rafnia. Thunb. ib. Wild. n. 9.—Leaves lanceolate, alternate. Flowers axillary, racemose."—Of this species alone, it seems, Wildenow had seen a dried specimen, and we regret that he did not give us some account of it.


The Linnaean herbarium contains two specimens, specifically different, which we presume belong to this and the last, but no human sagacity can appropriate them; except that one of them, with large and feebly purplish flowers, having rather the narrowest leaves, may be taken for filiformis. This is marked as gathered by Thunberg. The other has much smaller and yellow flowers. The stem is round in both.

11. R. retroflexa. Bent Rafnia. Thunb. ib. Wild. n. 12.—Leaves obovate. Branches reflexed backwards and forwards."—A specimen from Thunberg answers to the above name and character, except the leaves being rather linear-lanceolate than obovate. Their colour is somewhat glaucous. Flowers more or less terminal, on short stalks, with a wool-shaped trichia, or abortive leaf, at the base of each stalk.


All the species turn more or less black in drying. For Rafnia retusa of Venenat, Malmais. t. 53, see TEMPLETONIA hereafter, and Ait. Hort. Kew. v. 4. 269.

RAFSO, in Geography, a small island on the E. side of the gulf of Bothnia. N. lat. 61° 37'. E. long. 21° 12'.

RAFSUND, a town of Sweden, in the province of Jamptland; 28 miles S.E. of Trondhj.

RAFT, in Sea Language, a fort or float formed by an assemblage of various planks, or pieces of timber, fastened together side by side, so as to be conveyed more commodiously to any short distance in a harbour or road, than if they were separable. The timber and planks, with which merchant-ships are laden in the different parts of the Baltic sea, are attached together in this manner, in order to float them off to the shipping.

This means of conveying timber to navigable situations may be advantageously practised in many places. It is found of great utility in many of the northern parts of the island as well as others, near canals and rivers, where a cheap conveyance for such articles is required.

The balsa or catamaran used by the Indians and Spaniards in South America, is only a raft made of the trunks of the balsa; for an account of which, see the article BOAT.

They have one mast, on which is hoisted a large square sail; and a pair of oars, whose poles rest on each side the raft. When a fore-and-aft sail is set, a pair of oars is rigged forward. These rafts were the first conveyance by water, no doubt, long before vessels of a better construction were thought of; and what is still more surprising, they are made to float with foul winds, and steer, as well as any other kind of vessel, by means of an invention similar to, and perhaps the original of, that which is now called "a flying-keel." They have for this purpose planks about ten feet long, and fifteen to eighteen inches wide, which slide vertically in the spaces between the trunks which form the raft. It is only necessary to immerge them more or less, and put down a greater or lesser number at the fore or after part of the raft, to make it either luff-to, or fall-off from the wind, tack, veer, lie-to, and perform every necessary manoeuvre. The number of these planks is five or six, and if one of these planks be drawn up forward, the raft will keep away; and, if one is raised abaft, it will come to the wind. This sort of raft, from the simplicity of its construction, might perhaps be well adapted to many cases of emergency, after ship-wreck upon coasts, distinct of all other materials for ship-building.

RAFT-PORT, in a Ship, a square hole cut through the futtocks of some ships, immediately under the counter, to receive the planks or pieces of timber which are brought to lace her for transportation; and which, on account of their great length, could not be received aboard otherwise.

RAFTERING, in Agriculture, a provincial term used for a sort of ploughing in narrow ridges, or small ridges. It is useful for exposing a large surface of earth to the influence of the atmosphere.

RAFTERS, in Building, are pieces of timber, which, standing by pairs on the rafter-piece or rafting-piece, are laid in an angle at the top, and form the roof of a building.

It is a rule in architecture, that no rafters should stand farther than twelve inches from one another.

For the sizes or scantlings of rafters, it is provided by act of parliament, that principal rafters from 12 feet 6 inches to 14 feet 6 inches long, be 5 inches broad a-top, and 8 at the bottom, and 6 inches thick. Thse from 14, 6 to 18, 6 long, to be 9 inches broad at the foot, 7 a-top, and 7 thick. And those from 18, 6, to 21, 6, to 10 inches broad at the foot, 8 a-top, and 8 thick.

Single rafters, 6 feet 6 inches long, to be 4 and 3 inches in their square.

RAFTY, a provincial term signifying damp and muddy, as corn or hay in a wet season.

RAG, or RAK, among Hunters, denotes a company or herd of young colts.

RAG, or RAGG, ROWDY, in Mineralogy. See FERRITES.

RAG, a turn piece of cloth of any sort. See the next article.

RAGS, WEALLEN, as well as the clippings of pitch marks upon sheep, are good manure. The rags should be chopped small, about an inch or two square, and scattered on the earth at the second ploughing; for being thereby covered they will begin to rot by feed-time. They imbibe the moisture of dews and rain, retain it long, and, according to Dr. Home, keep loose dry soils in a moist state. They formerly coit about fourpence a bushel at London, from whence many loads were sent every year to Dunstable, which is thirty-three miles, where they are laid on even stiff lands, just after the fouling of the corn, allowing to the acre four sacks, of six bushels each; they are much higher now, at more than double
double this price, and no quantity of any great account to be procured. See MANURE, and Top-dressing.

The farmers in Oxfordshire make use of rags of this sort, procuring them from London and other places, at the rate of from eight to nine pounds the ton, which, with the carriage, laden them in upon the farms from nine pounds ten shillings to ten pounds. By some they are spread upon the clover lands, lays or layers for weeds, in the proportions of from three or four to fix hundred weight to the acre. Tried with dung in this way, in the quantity of seven hundred weight to the acre, the dung is found the better dressing. They are also applied for turnips, for which crop they are ploughed in before the winter, as soon as the wheatsowing is over; if ploughed in at the time of sowing turnips, they will not work for that crop. Some for this crop give half a coat of rags, and half a coat of chaff-fold. When applied on the clovers they seldom last longer than two years. Others think that half a coat of rags, and half a coat of dung, is the most beneficial method of applying this sort of manure. Some think rags are more durable than any other manure. Rags are occasionally brought from Whitney to this district, at from seven shillings and sixpence to eight shillings and sixpence the hundred weight, and five hundred weight spread upon the acre: they commonly last only one crop, but sometimes for two, and are found superior to any thing for wheat. They are ploughed in; and if the season be very dry, do not answer so well. They are supposed to do bale on a summer fallow for this crop.

In Suffolk rags are chiefly of service in the hop grounds, for which they are thought an excellent manure. Very great benefit is said to have been derived from the application of these rags, in contributing to preserve this sort of plantation in a state of constant moisture, and vegetation in the dry season, when grounds which have been manured with dung, have been dried up, and the hop crops have failed. Rags have likewise been found very useful on the moving grounds in some parts of Lancashire, when laid upon them in a pretty full proportion. When cut or chopped sufficiently small, they readily sink down upon the surface of the land, and do not afford any port of interruption to the fytch, while they absorb and keep in the moisture, which is of material benefit to such gross lands as are inclined to be dry.

RAG, in a Ship. See BOLTS.

RAGAL, in Geography, a town of Germany, in the county of Plundenz; 10 miles E. of Plundenz.

RAGALBUTO, a town of Sicily, in the valley of Demona; 23 miles S. of Cefalu.

RAGALMATO, a town of Sicily, in the valley of Mazzara; 8 miles N. of Naro.

RAGAMMEE, a town of Ceylon, near the W. coast; 58 miles S. of Columbo.

RAGANELLO, a river of Naples, which runs into the gulf of Tarento, near Civita Mandonia.

RAGAPILLY, a town of Hindostan, in Golconda, near the left bank of the Godavery; 5 miles S.E. of Badrachilum.

RAGATZ, a town of Switzerland, in the county of Sargans; 5 miles S.E. of Sargans.

RAGAY, a town on the S. coast of the island of Luzon. N. lat. 15° 35'. E. long. 123° 40'.

RAGGED, in Heraldry. See RAGULED.

RAGGED Heron, in Falconry, is a hawk that has its feathers broken.

Ragged Robin, in Botany. See Lycinis.

Ragged Harbour, in Geography, a bay on the E. coast of Newfoundland, being a part of Catalina bay; 2 leagues N. of Catalina harbour. N. lat. 49° 45'. W. long. 55° 40'.

Ragged Helmet, a small island in the Mergui Archipelago. N. lat. 10° 5'.

Ragged Island, a small island in the East Indies, near the island of Paraguay. N. lat. 11° 24'. E. long. 115° 50'.—Also, a small island among the Bahamas. N. lat. 22° 27'. W. long. 77° 18'.

Ragged Point, a cape on the E. coast of the island of Bermuda. S. lat. 2° 13'. E. long. 116° 40'.—Also, a cape on the N. coast of the island of St. Christopher. N. lat. 17° 30'. W. long. 62° 42'.

RAGGIIVOLO, a town of Italy, in the department of the Mincio; 19 miles S. of Mantua.

RAGHUS, in Hindu Mythology, is the name of the ancestor of Rama, one of their deified heroes, who is hence sometimes called Raghuva, or son of Raghu. Buddha, or Bouddha, another of the Indian deities, is said to have had a son also of this name.

RAGHUVA, a name of the Hindoo deified hero Rama, signifying a descendant of Raghu, a warlike character. All these names are still very common among Hindoos: whether confined to the sect who, as chiefly worshipping Rama, are called Ramanui, or more extensively given, we are not informed. See Rama.

RAGIAN, in Geography, a town of Peria, in the province of Fariflant; 130 miles N.W. of Schiras. N. lat. 30° 40'. E. long. 50° 8'.

RAGLAND, a small village of Monmouthshire, here mentioned on account of its castle, the ruins of which evincing its grandeur and magnificence, command the attention of travellers. During the rebellion it was held for the king, and defended to the last extremity by the marquis of Worcester; 8 miles W. of Monmouth.

RAGMAN'S Roll, or Ragman's Roll. See Roll.

RAGNIT, in Geography, a town of Prussian Lithuania, on the river Memel, endowed with the privileges of a town in the year 1722. Its ancient castle was famous even in the times of Paganism. The knights of the Teutonic order built it, with additional works, in 1255; but being destroyed in 1355, it was rebuilt a second time, and called Landeshuth; but afterwards it obtained the name of Ragnit from the river which passes by it; 36 miles E.N.E. of Königsberg. N. lat. 55° 5'. E. long. 22° 18'.

RAGOGNA, a town of Italy, in Friuli; 16 miles N.W. of Udina.

RAGOOGUR, a town of Hindostan, in the Malwa country, and circtr of Kitchwana; 116 miles N.E. of Oujen. N. lat. 24° 23'. E. long. 73° 30'.

RAGOTSKI, Francis, in Biography, the second of the name, prince of Transylvania, distinguished by his courage and patriotism, was born in 1676, at the castle of Bozlin, in Hungary. When he was only a year old he lost his father, prince Francis, and was left to the care of his mother, Helena Sereni, who afterwards married count Tekei. During his education he was carefully watched by the house of Auloria, and his correspondence with his mother, who had retired to Constantinople, was entirely broken off. He was now suffered to travel to most of the courts of Europe, and to contract a marriage with the princess of Helff Rohnfel. Zealously attached to the independence of his country, which was kept in a state of great degradation by the Imperialists, he secretly entered into a negociation with the French king, Lewis XIV., but being betrayed by one of his confidens, he was arrested, and a charge of treason was preferred against him. The sentence of guilty was soon pronounced, and he was committed to the custody of an officer,
officer, who, however, connived at his escape, and he arrived in a dragoon's habit at the frontiers of Poland. Here he received assurances of affiliation from France, and immediately published an eloquent manifesto, calling upon the nation to free itself from the Austrian yoke. Numbers joined him; being, however, but half armed, he was fearful of trusting his cause in their hands, and withdrew to the frontiers of Poland, where he was joined by fresh recruits. With these he ventured to make some progress; stormed several fortresses; and took a severe revenge upon the Imperialists, who had given no quarter to the Hungarian insurgents.

At this period the crown of Poland was vacant, through the deposition of Augustus by Charles XII. of Sweden, and the Polish chiefs were desirous of placing it upon the head of Ragotzki. But he had no such ambitious views: his great object was to liberate his country, and he refused to desert its cause for any other prospects. He accordingly pursued his successes, and by the reduction of Tokay, obtained the submission of almost the whole of Lower Hungary. So high was his reputation, that the diet of Alba Julia, in 1754, proclaimed him prince of Transylvania, with which dignity he was afterwards solemnly invested. He obtained likewise the title of protector of Hungary, and Lewis XIV. sent to him a public embassy. He soon began to feel the difficulty of supporting a popular insurrection against the arms and policy of a powerful sovereign, as well by the abandonment of some of his allies, as by the defection of his troops. He had another opportunity of giving a refusal to the crown of Poland, which was offered him by the czar Peter, weighing thereby his sincere attachment to the cause of his country, and he employed all the resources of valor and good conduct to support a declining cause. In 1751, a treaty was concluded between the Hungarian states and the emperor, into which he refused to enter, although the first article secured his life and property, with the title of prince of Transylvania. Mortified by the failure of his patriotic exertions, he withdrew to Turkey, renouncing his great estates, and preferring an honourable poverty to a splendid servitude. He afterwards passed some time in France, then returning to Turkey; he fixed his final residence at the castle of Rodolfo, on the sea of Marmona. There, says his biographer, "a Christian among Mahometans, and a philosopher among barbarians, he tranquilly closed his life in 1733, at the age of 61." He left "Memoirs of his Life," which were published in the "Revolutions de Hongrie," printed at Paris in 1739. In 1751 there appeared a work, entitled "Testament politique et moral du Prince Ragotzki," the authenticity of which is doubted. Moreci.

RAGOUT, or RAGUE, a sauce or flavoring, intended to increase or recover the appetite when languishing, or loft.

The term is French, but naturalized. It is also used for any high-flavored dish, prepared of flesh, fish, greens, or the like, by stewing them with the addition of bacon, salt, pepper, cloves, and the like highly-flavored ingredients.

We have ragoos of beef, of crav-fish, of giblets, of asparagus, of endive, of cocks-combs, of gammon, of celery, &c.

The ancients had a ragout, called garum.

RAG-PAVING. See PAVING.

RAG-STONE, a name given by our artificers to a kind of stone, which they use for setting an edge upon knives, chisels, and other tools. It is a greyish-colored stone, containing a large quantity of talc-like particles, and splits easily into thin flakes. It is a soft stone, and is used only for smoothing the setting an instrument after the edge has been prepared by grinding or rubbing the tool upon some other stone of a coarser texture. We have this from Newcastle and many other parts of the north of England, where there are very large rocks of it in the hills. This kind of stone is in some districts considerably blended and intermixed with the foul, rendering it of a more barren and unfertile quality.

RAGUENET, l'Abbé, in Biography. In 1702 the publication of a pamphlet, entitled "Parlele des Italiens et des Français en ce qui regarde la Musique et les Opéras," by this author, a man of taste and intelligence, who had redressed some time at Rome, gave birth to a long, but ineffec-
tual controversy, concerning the degrees of perfection, and superiority of French and Italian music. The book was licensed by Fontenelle, who said in his testimony, that he thought it would be very agreeable to the public, provided they were capable of equity." This declaration, however, did not prevent Frencu, the continuator of Bonet's "Histoire de la Musique," from attacking the author and Italian music in a most furious manner, treating both with equal contempt and obloquy.

The French, after this period, seem to have enjoyed their lyric fondness in great comfort and tranquility till 1732, when the performance of Pergolesi's "Serva Padrona" at Paris, by a company of burletta singers from Italy, set the musical republic in a flame which has not yet been extinguished.

There had, indeed, been a sensation excited, that was rather turbulent, and tending to a civil war, on the first appearance of Rameau as a dramatic composer in 1733, who, by new harmonies and accompaniments, had given offence to the true believers in the worship of Lully; but this soon subsided, and the nation not only heard his compositions with rapture, but reverenced him as "a theorist, to whom music was as much indebted as physics and philosophy to Newton."

This little work was published in English in 1709, and has been said to be translated by Galliard. If this worthy pros-
fessor was the translator, it was before he had made himself so completely master of the English language, as he appeared to be afterwards, in his translation of "Toi on florid Song."

The English of this parable is feeble and inaccurate; many of the notes, however, are good, and manifest a person who had been in Italy, and well knew the state of music in that country, as well as in England, at the beginning of the last century, during our first attempts at opera, before the arrival of Handel.

RAGUIER, Le, the name given by the French sailors to a wind peculiar to the gulf of Alexandretta or Scande-
room, which, rushing from the snowy summits of the mountains, frequently forces ships to drag their anchors several leagues.

RAGULED, or RAGGED, in Heraldry, is applied to an ordinary, or, gr. a crois, whose outlines are jagged or knotted.

Ragued differs from indented, as the latter is regular, and the former not.

The bearing is very ancient: Julius Cæsar gave for his badge, a boar's head, on a ragged taff.

Ragged is sometimes also used in the lene of truncated, or couped, and applied to a branch that is faved from the tree; or a fock fawed from its root.

RAGUN, in Geography, a town of Germany, in the principality of Anhalt-Dessau, on the Mulda; 9 miles S. of Dessau.

RAGUNDA, a river of Sweden, which rises in the lake
lake Storfo, and in the province of Medelpadia, changes its name to Indal.

RAGUSA, a small republic, situated on the eastern shore of the Adriatic, and nevertheless regarded as an Italian state. It has a population of about 56,000 persons, on an extent of 553 square miles. As this state is adjacent to the territory formerly belonging to the Venetians in Dalmatia, its government is regulated on the model of the Venetian aristocracy. Its religion is the Catholic, and its language the Slavonic, though most of the inhabitants speak Italian.

The fee is archiepiscopal, with six suffragans, and its commerce is considerable. The chief magistrate of the aristocracy in this island, called the "rektor," is changed every month. Here is also a council of ten, and a great council composed of all the nobles above twenty years of age, and these nominate the "Pregadi," a senate of sixty, which superintends all state affairs, receives and deputes ambassadors, and confers offices. The revenue of Ragusa was formerly estimated at a ton of gold, or about 100,000 florins. This small republic has found it necessary to engage the protection of the Turks, for which it pays a tribute of about 20,000 sequins; though the commerce is beneficial to the Ottomans, in supplying them with ammunition. Jealousy of their neighbours induces the Ragusans to shut the gates of their city, except for a few hours in the day. The capital is Ragusa; and it has been lately annexed, together with Dalmatia, to the kingdom of Italy. It now (1814) probably waits for a new allotment. The Ragusans have many country-loufes at Gravosa, another sea-port town. Stagno is another little town, subject to Ragusa. Of the Ragusan isles, the chief is Milet, or Melada, fertile in oranges, lemons, and good wine. On the north there is a tolerable haven, with a town of the same name. Three or four little isles in that neighbourhood also acknowledge the sovereignty of Ragusa.

RAGUSA, the capital of the above-mentioned island, is an ancient city, being the Ragnum of the Romans, and in the tenth century it became the metropolis of Dalmatia. In the 13th century it was conquered by the Venetians, and afterwards for a time subject to the crown of Hungary. It is a well-built city, and its commerce is not incon siderable. The harbour might be rendered capable of a firm defence; and the circumjacent isles are beautified by nature and art. Earthquakes, however, have been terrible; and that of 1667 destroyed 6000 persons; 243 miles N.W. of Saloniaki. N. lat. 42° 58'. E. long. 18° 18'.

Ragusa keeps accounts in ducats of 40 groffetti, each groffetto being divided into 6 foldi; but at the public offices accounts are mostly kept in perperi of 12 groffetti. Formerly the ducat represented a real coin struck at Ragusa, and had a fixed value; but since it has become a money of account, it is always equivalent to the Turkish piaster, and therefore liable to a change of value. At Ragusa no gold coin is struck; its silver are the old tallari, or dollars, commonly called Viliini or Ragunini, weighing 1 oz. 7 car. (Ragusa wt.), containing 17 parts of pure silver to 13 of alloy, and reckoned at 1/4 ducat, or 60 groffetti; but on account of the depreciation of the ducat, the value of the tallari has been proportionally raised in weight. The new tallari, called libertine, weighing 1 oz. 10 car. and containing 9 parts of pure silver to 6 of alloy, was valued at 80 groffetti. But since the year 1796, ducats have been coined of 40 groffetti, weighing 1/2 an ounce; also perperi of 12 groffetti, weighing 20 carats, and half perperi in proportion; these three coins, on the model of pure silver, and 11 of alloy. The groffetti, none of which have been lately coined, are still in circulation; they weigh the 60th part of an ounce, and bear the same value with the paras of Constantinople. The ducat of 1796 is worth 13½ florins, which is nearly the value of the Turkish piaster. The tallari, or Ragunini of 1759, is worre than the English standard 4 oz. 2 dwt.; its weight is 18 dwt. 7 1/2 gr., and its content in pure silver 256 gr., and its value in florins 21 1/2 d.

That of 1794 is worre 3 oz. 19 dwt., its weight 18 dwt. 1/2 gr.; its content in pure silver 256 gr., and its value in florins 18 1/2 d.

The ducat of 1797 worre 5 oz. 11 dwt.; its weight 8 dwt. 17 1/2 gr., content in pure silver 97 gr., and value in florins 15 d.

The pound of which gold and silver are weighed at Ragusa consists of 12 ounces; the ounce is divided into 6 faggii; the faggio into 22 carats, and the carat into 4 grains. But the pound of commercial weight is equal to 5607 English grains, or 12 oz. 13dr. avoirdupois; the former being 5062 English grains. The ell of Ragusa measures 27 1/2 French lines, or 20 1/4 English inches.

RAGWORT, in Botany. See OTHONIA, SENECIO, and SOLIDAGO.

RAGWORT, in Agriculture. A very pernicious plant of the weed kind, which is sometimes termed feagrin. It has a green stalk in its early state, but, as it advances in age, inclining to violet or purple, especially downwards. Its flowers are yellow, and thick-set, and composed each of a number of small pointed leaves. It runs to seed in the latter end of summer. The small, both of the stalk and leaves, which are jagged, as well as the flower itself, are so offensive to animals, as that hardly any will feed upon it, except when almost starved.

It has been proposed to destroy it by picking out the roots, and feeding the land clove with fpeck. It molly affects meadows and pasture lands when the soils are good.

RAHA, in Geography. See JERICO.

RAHABAH, or RABA, town of Arabia Debsert, near the Euphrates, on the road by which caravans travel from Syria to the Arabian Irak; 110 miles S.W. of Moful. N. lat. 35° 5'. E. long. 40° 21'.

RAHAH Malik Ben Tanz, a town of Alatic Turkey, in the province of Dirbexir, on the Euphrates; 50 miles S. of Kerkieh.

RAHAB, a town of the desert of Syria, containing about five or six thousand inhabitants, situated on a plain, surrounded with date-trees; 70 miles N. of Meghild Ali.

RAHANPOUR, a town of Bengal; 42 miles N.W. of Nattore.

RAHAPA, a small island in the East Indian seas, near the E. coast of Borneo. N. lat. 4° 58'. E. long. 114° 4'.

RAHAS, in Ichthyology, a name given by some authors to the torpedo, or cramp-fish.

RÄHEINA, in Geography, a bay on the W. coast of Mowwee, one of the Sandwich islands. N. lat. 20° 50'. E. long. 205° 19'.

RAHMAPAT, a large lake in the Arabian Irak, 90 miles in circuit, near Meghild Ali.

RAHENSTEIN, a town of Bohemia, in the circle of Saatz; 19 miles S.W. of Saatz.

RAHMANIE, a town, or rather village, of Egypt, built
built on the W. bank, at the entrance of the canal of Damankour, which is navigable only at the rise of the Nile; 9 miles S. of Faouz; which fec.

RAHMETABAD, a town of Persia, in the province of Irak; 20 miles N.E. of Confar.

RAHNIS, or RAHIS, a town of Saxony, in the circle of Neutadt; 10 miles S.W. of Neutadt. N. lat. 50° 33'. E. long. 11° 46'.

RAHNY, a town of Bengal; 25 miles N.W. of Dinagepore.

RAHON, a town of France, in the department of the Jura; 6 miles S. of Dôle.

RAHOOH, a town of Hindoofooan, in the subah of Lahore; 198 miles S.E. of Lahore. N. lat. 31° 7'. E. long. 75° 42'.

RAHU, in Astronomy, is the Hindoo name of the planet of the ascending node, or dragon's head. Ketu is the name of the other node; and a fable, in the usual style of mythological allusion, is given under that article, of their origin and mithap. The malignant Rahu was decapitated, and Ketu was his head. In one painting of the Hindoo zodiac, the headless Rahu is represented of a black colour, in red clothing, mounted on an owl, and holding a flos in his hand: in another, he holds a spear, and flonds on a tortoise. In the fable given under Ketu it is related that Vithu was the decapitator of Rahu; other accounts assign that office to Narayana. Among the Hindoos, as we have had occasion to remark in several articles, their sciences, as well as their history and religion, are enveloped in a mafs of mythological allegory: a farther instance of which, connected with the subject of this article, is seen under Eclipse (Note. A reference being made from the article Ketu to this, we take the opportunity of correcting two typographical errors in that article. In its early part, for Kanyapâ, read Ka-nyapa; and in the fourth line of the second column, for or read a.)

RAHWA Y, in Geography. See RAWA.

RAI, or RAH, an ancient town of Persia, in the province of Irak, before Itipahan the capital of Persia. This was once a grand and proud city; and its ruins still cover a great extent of country. It holds a distinguished place in the annals of Persia: it is mentioned by Arrian and Diocletianus Siculan, as the capital of the province of Rhages, so called from the calamities brought upon this part of the empire by the earthquakes to which it formerly was, and is still subject. It is frequently mentioned in the wars of the renowned Haroun al Raâfîd; it was the capital of this part of Persia, in the reign of Alp-Arslân, and continued to flourish until it was sacked by the generals of Jenghis Khan. Its ruins are situated five miles S. of Tahraan, the present capital of Persia; and in the centre of them is a village, called Sheik Abdul Azzeem, from a son of the seventh Imam, to whose memory a noble mosque and mausoleum have been erected.

RAJA, denoting king, an appellation given in Hindoofooan, or the empire of the Moguls, to princes descended from those that ruled there before the conquest of the Moguls; who exercized all rights of sovereignty, only paying a tribute to the Great Mogul, and observing the treaties by which their ancestors recognized his superiority.

There are some rajahs who still retain a more independent sovereignty in the mountains: the Indians call them rai; the Persians, plurally, raijan: our travellers rajahs, or rajas. These have under their command foldours, called raja-san or persons descended from rajahs, who are a robust brave people, and who enter into the service of those who will pay them. The Great Mogul has several of these rajahs in his service.

'The chief lords of the Moguls, viz., the vice-roys, governors of provinces, and chief ministers of state, F. Crawf observes, are called ambas; and the idolatrous rajahs, or Indian lords who governed petty states before the conquest of their country, held the same rank at court with the ombras.

All the difference was, that the children of the rajahs succeeded their fathers in the show of the sovereignty left them; whereas the children of the Mahometan lords lose all in losing their fathers.

The Indians account four ages from the beginning of the world: and in the second, which lasted 1,256,000 years, they hold the rajas or kachstras had their rise; a noble caste, though inferior to the Brahms. Vice then, they say, began to creep into the world; men only lived to 300 years, and their stature was reduced, &c.

RAIA, the Ray, in Ichthyology, a genus of fishes of the order Chondropterygii, of which the generic character is, that it has five oblique spiracles on each side, placed beneath the neck; the head is small, pointed, and not distinct from the body; the mouth is beneath transverse, toothed; the body is broad, thin, and flat.

The individuals of this genus are all inhabitants of the sea only: they keep at the bottom, and in winter cover themselves with sand and mud: they feed on tectaceous animals, fish, or any animal substances which they may happen to meet with. They grow to a large size, sometimes exceeding 200lbs. in weight. The females are the larger, and produce their young alive, only one at a time, which, like the shark tribe, are inclosed in a quadrangular, black,orny shell, the corners of which end in slender incurved points, but not extending into long filaments, like those of the shark: the eyes are half covered with a thin membrane, oblong, placed on the upper part of the head: above these, in the place of nostrils, is a broad fulcus or groove, divided by a reticulate membrane, confining of creased folds, and closed with a valve: behind this fulcus are two small familiar orifices: the tongue is very broad, short, and smooth. The ventral fins are covered with a thick skin, and surrounding the body: the ventral at the base are connected with the anal; the fifth is generally ealuable, the liver is large, and producing a great quantity of pure oil.

Of this genus there are nineteen species, divided into three sections: viz. A. comprising the electric ray, or torpedo and skate; these have sharp teeth. B, including the king-ray and thornbacks, having obtuse teeth. And C, which are denominated uncertain, comprising five species, which inhabit the Red sea, or about the Cape of Good Hope, but which have not yet been sufficiently examined.

Section A. — With sharp Teeth.

Species.

* Torpedo; Electric Ray. The body of this fish is entirely smooth and flat. The species inhabits the Mediterranean, and grows to a large size: some have been taken that have weighed from 60 to 80lbs. each, but the average weight is less than 20lbs. It is of a dirty chalyf colour; the head and body are round, and but indistinctly separated. The body is extremely thin; behind the eyes are two wide foramina, which have been supposed to be intended by nature for conveying food; they are befit with six cutaneous fingers on their inner circumference, and communicate with the mouth. The torpedo can live about twenty-four hours out of the sea, and a short time longer, if put into fresh water;
It inhabits those places where the bottom is sandy, and buries itself superficially by flinging the sand over its back with a sort of vibration, which it gives to its extremities. It is in this situation that the torpedo sows its eggs, and the unwaried passenger, who inadvertently treads upon it, by the exertion of its electrical or benumbing faculty. This power is servicable to the animal in two important respects: as a means of defence against voracious fishes, and as a method by which it is enabled to procure its subsistence from among the smaller tribes; for the former, when electrified, is deprived of all possibility of seizing their prey; and the latter, after having unwarily approached the torpedo, and received the shock, are incapable of making their escape. (See Torpedo.) The food of the torpedo is furmullers and plaice; the former are so swift, that it is impossible for the torpedo to take them by pursuit, and as this fish has been found in its stomach, it is presumed that it was taken by means of the electrical shock. The torpedo has been taken off Pembroke, at Torbay, and near Waterford in Ireland. It is caught like other flat fishes, with the trawl, and is commonly found in water forty fathoms deep, in company with other species of this genus.

* Batesi; the Skate. This species is varied; the middle of the back is smooth; the tail is beft with a single row of spines. It inhabits the European ocean, and is thought to be the largest flat fish of the genus: the body above is cincereous, sometimes with a few black lines, beneath white, with waved lines of black dots; round the eyes are numerous small, hooked spines; in the males the fins are full of spines. Of all the larger fishes, the skates are the most numerous, and their numbers are in a great measure owing to their size, and to the protection afforded them by those frightful spines which nature has afforded them. There is not one of the rabidious tribes, excepting, perhaps, the cachalot and white shark, that has a swallow sufficiently large to receive them, and even these are probably deterred from their purposes of destruction by the armour with which their prey is covered. Of some the size is such as to defy all powers of destruction which even the shark himself possest. In England some of the species have been taken, weighing upwards of two hundred weight, but even this is far inferior to their enormous bulk in other parts of the world. Near the island Guadaloupe, a ray was killed more than twenty-five feet long, and almost fourteen broad. After all, the fishes of this tribe probably attain a much larger size than that of any individual which has ever yet been examined. It is only the smallest of the kind that approach the shores; the largest continue for ever prowling at the bottom in the unfathomable caverns of the ocean, where they continue perhaps to grow for a century.

The fishes are said to be found in March and April, at which time they swim near the surface of the water, several males pursuing one female. The females cast their young, as they are called, in May, and continue to produce till September: they are very prolific, not less than three hundred eggs having been found in the body of a single female. The rays generally frequent those parts of the sea where the bottom is black and muddy, where they devour every thing indiscriminately, but they are more delicate with regard to a baited hook. They devour any putrid substances whatever, but if the bait has been taken up and suffered to lie for any time in the open air, they will not touch it; they appear to receive the line, and to dread it; but the impulse of hunger overcomes their caution, and even though they perceive the danger, if thoroughly hungry, they devour the bait, as if regardless of the consequences. See Skate.

* Oxyrinchus; Sharp-nosed Raia. Varied; middle of the back with ten spiny tubercles. This is similar in shape to the skate, but with a longer and sharper snout; the colour of the whole upper part is cincereous, with several pale or whitish spots, intermixed with a few dark dusky streaks or variegations; beneath it is white, with dusky or blueish streaks; down the back and tail runs a single row of spines, and a few others are placed about the region of the eyes: the sides of the tail are also sometimes furnished with a row of smaller or weaker spines than those on the upper part; the eyes are large, as is also the mouth. This species, like the skate, sometimes, but not often, is taken of a very confiderable size. It is a native of the Mediterranean and Northern seas.

* Muraena. This species has a smooth belly and back: it has spines near the eyes, and a single row of them on the tail. It inhabits the Mediterranean; the body above is marked with an oblong spot.

* Fullonica; the Fuller Ray. The back is covered with spines; the eyes with a single row; pectoral fins and tail with a triple row. It inhabits the European seas; grows to a large size; the body above is cincereous, with numerous black spots; beneath it is white. The snout of this fish is short and pointed; the milican memrane is fringed; the teeth are small and sharp; and the tail is slender. It has been thought by some authors that this is only a variety of the next species.

* Rutilus; Rough Ray. The back of this species has a single spine; and the tail is beft with a triple row of spines. This is greatly allied to the thornback, but covered with more numerous spines, every part of the skin on the upper surface being variegated with dark curved aculei of different sizes; of these, one row of the largest runs down the middle of the back, and three, or sometimes five, along the tail; others are disposed about the eyes, and the fringes of the pectoral fins: the general colour is yellowish or whitish-grey, sometimes variegated with dusky or brownish clouds and streaks; the under side is white, and beft with very numerous scattered spines, but less strong than those on the upper side. It is about the size of a thornback. Mr. Pennant mentions one that measured nearly three feet from the nose to the tip of the tail. It is a native of the Mediterranean and other seas.

B. — Teeth obtusus.

Species.

Seaphen. Body nearly round; tail twice as long as the body, winged beneath, and with two long spines above, forked on each side. It inhabits the Red Sea, and in sometimes so large, as to reach three yards across; body above brown, with three rows of large hemispherical tubercles down the middle of the back; beneath it is quite flat and smooth, and it is of a reddish-white. It is from the skin of this species that a beautiful substance called Galalbat is prepared by the French, and which, being coloured with blue, green, or red, according to the fancy of the article, and afterwards polished, is so frequently used for various kinds of cafes, telescope tubes, &c. For this purpose the smaller or younger specimens are preferred; the tubercles in the more advanced or full-grown animals being too large.

There is a variety of this species: the length of the specimen described by Dr. Ruffell was about 9½ inches; the tail is about two feet nine inches long; the colour of the whole animal is a dull leaden above, with a deep blue tail; beneath it is dusky white; on the middle of the back there are only two pearl-formed tubercles instead of three; the tail is furnished with a sharp spine and a fin beneath. It is a native of the Indian seas.
RAIA.

AQUILA. The body is smooth; the tail is pinnate, with a long ferrate spine. This species is of a rhomboidal shape, but with a considerable dilatation: the pectoral fins approach to a subulate form; the colour is cinnereous above; pale or whitish beneath: the head is rather large, and the snout produced: the eyes are large and prominent, with yellow irides: the tail is long, slender, sharp-pointed, and furnished about the middle with a spine similar to that of the fling-ray. This species grows to a very great size, sometimes measuring ten, twelve, or even fifteen feet in length, and weighing upwards of three hundred pounds. It is found in the Mediterranean, Atlantic, and Indian seas, and is said to swim in a flower manner than most other rays; its prey on smaller fishes, and is said to try to strike and kill, or at least disable its prey with the caudal spine: when taken, it is observed to vibrate the tail with great strength and rapidity in all directions. It is not reckoned among the edible fishes; but the liver, which is very large, is said sometimes to be eaten, though it is more frequently used for the purpose of preparing from it a clear oil, which it affords in great plenty.

ASTINACUS; Sting ray. The body of this species is smooth; its tail has a long sharp spine, ferrate on the fore part, and another on the back; there are two other varieties of which the one has a smooth body; the back is beft with two spines, ferrate on the fore part; the body of the other is covered with spots.

This species is described as having a body somewhat approaching the ovate, the pectoral fins less pointed than in some other species of this division. The snout is pointed; the body more convex than usual; the colour of the whole animal above of a yellowish-olive, but the back is sometimes found to approach to a blue-brown; beneath it is whitish; the tail is of a considerable length, and without a fin, very thick at the base, and gradually tapering to the extremity, which is very slender: near the middle it is armed, on the upper part, with a very long, flattened, and sharp-pointed bone or spine, finely ferrated in a reversed direction on both sides: with this the animal is capable of inflicting very severe wounds on such as incautiously attempt to handle it; and it answers the purpose both of an offensive and defensive weapon. This weapon is annually cast, and as it frequently happens that the new spine has arrived at a considerable size before the old one has been cast, the animal is occasionally found with two, in which state it has been sometimes erroneously considered as a distinct species. This fish is said not to grow to a very large size. It is found in the Mediterranean, Atlantic, and Indian seas, and is numbered among the edible rays. On account of the danger attending the wounds inflicted by the spine, it is usual with the fishermen to cut off the tail as soon as the fish is taken. In some countries it is said to be illegal to sell the fish with the tail adhering to it.

It was formerly thought that the spine of the fish possessed a venomous quality, by infusing into a wound made by it some very active poison; this is now proved to be completely erroneous, and the effects sometimes produced by it arise entirely from the depth of the puncture and laceration, which, if taking place in a tendinous part, or among the larger nerves and blood-vessels, have often proved fatal. It may not be amiss to observe, that some ancient writers have debated upon the effects of this animal's powerful weapon in terms of considerable luxuriance; it was supposed to be not only poisonous in the living animal, but to preserve its poison when taken from the fish, and affixed to the head of an arrow or a spear; it was said even to destroy the most healthy and flourishing plant by its touch, and even to cause trees to die by striking the bark with its point. It formed the head of the fatal spear presented by Circe to her son Telephus, by which he was rendered superior to his enemies, and with which he, at length, unconfidently, flew his father Ulysses. The general habits of this species are similar to those of the rest of the genus, often lying flat, and in ambuscade on the soft mud at the bottom of the shores which it frequents, and feizing its prey by surprise; at other times it will pursue it through the depths of the ocean.

*CLAVATA; Thornback. The body of this species is fpinous; the teeth tuberculate; across the belly is a strong semilunar cartilage. This species grows to a very considerable size, though rarely equal in magnitude to the skate already described; in its general appearance it resembes that fish, but is somewhat broader in proportion, and is readily distinguished from the skate by the very strong, curved spines with which its upper surface is covered; these are more conspicuous down the middle and on each side of the back, where four or six, of much larger size than the rest, are generally seen; the remaining parts being furnished with many scattered spines of a smaller size, interspersed with still more minute ones, and the whole skin is of a rough, or thargue-like surface; the back is marked with an uncertain number of pale or whitish round spots of different sizes, and which are commonly surrounded with a blackish or dark coloured edge; these spots are said to be caused by the shedding of the spines at different intervals; along the middle of the back runs a single row of strong spines, continued to the tip of the tail; the colour of the skin is a brownish-grey, with irregular blackish or dusky variegations; the under part is white, with a light cast of flesh-colour, and about the middle of the body, as well as on the fins, are disposed several spines similar to those on the upper side, but less strong. The thornback is an inhabitant of the Mediterranean and other seas, and is held in some esteem as food, though not considered equal to the skate in goodness.

RHINOBATOS. Body long, tapering; snout lengthened. This is reckoned a very remarkable species, and is thought to connect in some degree the genera of raia and fquals, the body being much longer than in the preceding kinds of ray; the snout is lengthened, but not very sharp; and the body, which is moderately convex above, and flat beneath, gradually tapers from the shoulder to the tail, which is furnished above with two fins, of an oblong shape, and situated at a considerable distance from each other: the tip of the tail is also dilated into an oblong fin. The colour of the whole fin is of a dull earthy brown, paler beneath, and the skin is everywhere roughened by minute tubercles. This fish is said to grow to the length of about four feet, and is a native of the European seas. It is very frequently seen about the coasts of Naples.

DIJNDESTIS. Tail-fin two-lobed; spines in a triple row at the beginning of the back, and afterwards in a single row; the first dorsal fin is above the ventral. It inhabits the Red sea, and is about two yards long. The body is a little rough, and of a pale ash colour; above it is varied with whitish spots; beneath it is whitish; behind the vent are a few brown and white spines.

LUMMA. Body oval, smooth, tesselaceous, with blue spots; pinnate tail with a single spine. It inhabits the Red sea, and is hardly a foot long; the spots oval, unequal, beneath whitish. It is much allied to the eagle-ray, and is of a reddish-brown colour above; the tail is somewhat longer than the body, marked above, for half its length, with two longitudinal blue stripes, and is furnished about the middle with one, and sometimes with two, large and ferrated spines, which
which are covered at their base by a blueish-brown skin; the under part of the body is pale or whitish.

**Arnak.** Body orbicular, silvery; tail round, without a fin, and furnished with two spines. It inhabits the Red sea; the teeth are granulate.

**C. Uncertain.**

**Ommeneschrit.** Tail round and spotted. It inhabits the Red sea, and very much resembles the R. paffinaca.

**Tajara.** Tail round; body beneath snowy. It inhabits the Red sea. When just taken, it beats violently with its fins.

**Schoukie.** Body with a few remote spines. It inhabits the Red sea, and approaches the shores by night. The spine on its tail inflicts a dangerous wound.

**Rajensia.** Back with a single fin; the tail is short, pinnate at the end; the body is smooth and unarmed; and the snout is a little obtrude. It inhabits near the Cape of Good Hope, is shaped something like the torpedo, except that it has a fin on the back. The body is small and orbicular; above it is convex, beneath flat.

**Rajabarry, in Geography,** a town of Bengal; 10 miles S. of Dacca. N. lat. 23° 24′; E. long. 96° 36′.

**Rajacotty,** a town of Thibet; 60 miles N.W. of Sirinagur.

**Rajagunge,** a town of Assam; 16 miles S. of Gentiah.

**Rajagur,** a town of Hindooftan, in Bahar; 35 miles W.S.W. of Gayah.—Allo, a town of Hindooftan, in Guzerat; 10 miles N.E. of Champahee.

**Rajahun,** a town of Hindooftan, in the circuit of Ciccaco; 12 miles W. of Ciccaco.

**Rajakeria,** a town of Hindooftan, in the province of Agra.

**Rajamundry,** a circar of Hindooftan, bounded on the N. by the circar of Ciccaco and Golconda, on the E. by the bay of Bengal, on the S. by the circar of Ellore, and on the W. by Golconda. It is crossed by the Bain Gonga from N. to S.—Allo, the capital of the abovementioned circar, situated between Ellore and Ciccaco, on the Godavery. Its principal riches consist of forests of teak-wood. N. lat. 17° 10′; E. long. 81° 57′.

**Rajanagur,** a town of Bengal; 25 miles S. of Dacca.—Allo, a town of Hindooftan, in the circar of Rajamundry; 7 miles N.E. of Rajamundry.

**Rajania, in Botany,** so called in honour of our immortal naturalist, the Rev. John Ray, the most accurate in observation, the most philosophical in contemplation, and the most faithful in description, amongst all the botanists of his own, or perhaps any other, time. His life will be given hereafter, in its proper place. Plummer, who established this genus, finding the name *Raia* preoccupied by zoologists, contrived to call the plant *Jan-Raia*; which Linnaeus turned about into Rajania, still retaining the idea of the Christian name, combined with the other. But such an idea is ludicrous to English ears, and is happily not, in general, perceived. We presume to alter the orthography in one letter, writing the word as it is always pronounced, and deducting it regularly from the Latin *Raia*, by which name the perfom commemorated is known all over the literary world.—Plum. Gen. 33. t. 20. Linn. Gen. 525. Schreb. 692. Willd. Sp. Pl. v. 4. 788. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 5. 391. Jaff. 43. Lamarck Illust. t. 818. Garin. t. 14.—Clans and order,


Female, Cal. Perianth superior, of one leaf, bell-shaped, in six deep segments, permanent, withering. Cor. none. Pfil. Germum inferior, compressed, with a prominent border at one side, three-celled; styles three, the length of the calyx; stigmas obtuse. Peric. Capsule membranous, of three cells, without valves, crowned by the calyx; two of the cells barren, almost obliterated, without wings; the third fertile, compressed, extended into a very large, half-ovate, membranous wing. Seed solitary, nearly elliptical, compressed.


Section 1. Leaves simple.

1. *R. bafata.* Halberd-leaved Raiania. Linn. Sp. Pl. 1461. (Jan-Raia scandens, folio oblongo, anugo et auriculato; Plum. Gen. 33. Bryonia rufctu alato, folis auriculatis; Plum. Amer. 84. t. 98.)—Leaves oblongate; somewhat heart-shaped at the base.—Gathered by Plummer, about Port-de-paix in the island of Hifpaniola. Root perennial, sometimes large and ovate; sometimes four or five inches long, and two thick, round at each end, like a fawage. Its substance resembles that of a radish, without any internal fibres; the bark thin, ash-coloured, a little rugged and warty; the flesh very white, tainting like a bean. This root throws up only one very slender, long, climbing, smooth, knotty *flem*, thickest at the base, where it is accompanied by several fibrous radicles. We presume it to be annual. Leaves scattered, spreading, on short flanks, smooth and membranous, about three inches long; heart-shaped, dilated, abrupt, and seven-ribbed at the base; then suddenly elongated into a nearly linear, entire, central, three-ribbed lobe, blunth, with a small point; the under side paler, and rather downy. Stipulas in pairs, awl-shaped, minute. Flowers small, whitish, in simple, axillary, drooping clusters. *Bracteae* minute, ovate, acute, solitary at the base of each partial flake. *Fruit,* as Plummer says, like half that of a maple-tree, of a silvery hue when young, but afterwards tawny.

2. *R. cordata.* Heart-leaved Raiania. Linn. Sp. Pl. 1461. Ait. n. 1. (Jan-Raia scandens, folis tami; Plum. Lc. 148. t. 155. f. 1.)—Leaves ovate; somewhat heart-shaped at the base; seven-ribbed.—Native of the West Indies, from whence it was sent to Kew garden, in 1786, by Mr. Alexander Anderson. It flowers in the flower in July, and we cannot but with some accurate botanist would publish a good figure and description of the plant, of perfect to its name. Plummer represents the habit of the root, *flem,* &c. much like the foregoing; but the leaves are regularly ovate, pointed, more or less heart-shaped at their base, and furnished with seven ribs continued from that part to the point. These ribs are connected by numerous transverse veins. *Inflorescence, flowers, and fruit,* much as in *R. bafata,* but having seen no specimen, we can say nothing respecting the *fipulas or bracteae,* none of which are noticed in the plate.

Quiqualis. Narrow-leaved Rainia. Swartz 

Leaves linear-lanceolate; rounded at the base, three-ribbed. Native of extremely dry bushy places, in the west part of Hifpaniola, where it climbs upon high trees, flowering in May. Root annual. Stem thread-shaped, round, twining, flaccid, subdivided. Leaves nearly a span long, entire, three-ribbed, veiny, smooth. Flowers small, rounded, red, under the flowers. On some plants the latter are entirely male, with six nearly sessile anthers; on others all hermaphrodite, with six perfect flowers, a triangular oblique stem, no style, but three minute stigmas. Campana as in the rest of the species. Swartz.

5. R. quinquifolia. Five-leaved Cluttered Rainia. Linn. Sp. Pl. 1462. (Jan-رایاراجیا quinquifolia; Plum. t. 149. f. 2.).—Leaves five together at each joint, elliptic-oblong. Clusters lateral, between the joints. Native of the Weel Indies, but hitherto observed by Plumier only. This seems to have the habit of all the foregoing, except that the stem has tumid joints, at each of which stand five elliptic-oblong, obtuse, entire, three-ribbed leaves, about three inches long, on short footstalks. The clusters are represented not axillary, as in the others, but lateral and alternately, from the spaces of the stem between the joints.

Section 2. Leaves compound.

6. R. quinata. Five-leaved Umbellate Rainia. Thumb. Jap. 148. Mart. n. 6.—Leaves five on a common stalk, emarginate. Umbels axillary.—Observed by Thunberg about Nagasaki and in Kofu, in Japan, flowering in April and May. The Japanese call this plant Fagi Kusa, and Akki. Stem twining, round, smooth, ash-coloured, branched. Leaves several together, axillary, falcate, smooth, of five separately falcate, umbellate, ovate, entire leaflets, each from three-quarters of an inch to an inch and a half long, emarginate with a point. Common footstalks thread-shaped, smooth, two inches or more in length; partial half as long as the finger nail. Flowers in umbels, from the same buds as the leaves, on slender stalks as long as the footstalks; partial stalks capillary, the length of the nail. This species differs from the hall in having compound leaves, and umbellate flowers. Thunberg.

7. R. breviflora. Six-leaved Cluttered Rainia. Thumb. Jap. 149. Mart. n. 7.—Leaves five on a common stalk, oblong, acute. Flowers racemose. Native of the country of Fakona, in Japan, among bushes, flowering in April. Its vernacular names are Akki, Mhe Kusa, and Tzu So. The stem is round, falcate, smooth, climbing. Leaves alternate, smooth, fix on a stalk, umbellate, on slender partial stalks, oblong, acute, entire, veiny, two inches long; pale at the back. Common footstalks round, bent, three or four inches long, swelling at each extremity. Flowers in axillary clusters, snow-white. Differs from R. quinata in having mostly six leaflets on a stalk, which are acute, reticulated with veins at the back, and larger than in that species. The flowers moreover grow in clusters, not umbels.
a town of Hindoostan; 20 miles E.S.E. of Allahbad. N. lat. 24° 40'. E. long. 80° 17'.

RAJEGUDAR, a town of Hindoostan, in Lahore; 35 miles E.N.E. of Behnbur.

RAJEHAUT, a town of Bengal; 16 miles N.W. of Biffimpour. N. lat. 23° 13'. E. long. 86° 40'.

RAJEHAR, a catarc of Bengal, bounded on the N. by Purneac, on the E. by Purneac, Maulida, Dinapour, and Raujeely, on the S. by Sultanabad, and on the W. by Hindoea and Boghpoor.—Also, the capital of the above catarc, lying on the W. bank of the Ganges, nearly in the parallel of Maulida, and about 20 miles from it; at the foot of the chain of hills which projects into the river at Sielyguly and Ternagully. It is in a ruinous state, although not above 14 centuries ago the residence of the viceroy; and has hardly the population of an ordinary market-town at present. Its situation is romantic, but not pleasant; for in Hindoostan, the hills and catarcs being always covered with wood, that beautiful swelling of the ground, which is so justly admired in European landscapes, is loit; and the fancy is presented at beet with nothing beyond a wild scene; which can only be relished by being contrasted with soft and beautiful ones. It is more than thirty miles above the head of the delta of the Ganges, and therefore M. d'Anville placed it erroneously by assigning its situation at this place. N. lat. 25° 21'. E. long. 87° 56'.

RAJEMAL, a town of Hindoostan, in Vifapour; 37 miles N.W. of Poonah.

RAJEMUNGALAM, a town of Hindoostan; 16 miles S. of Tinevelly.

RAJTEA, one of the South-eea islands, named also Uliteta; which fee.

RAJETPOUR, a town of Bengal; 15 miles S. of Rogonatpour.

RAJEWICE, a town of Lithuania; 42 miles S.S.E. of Brzece.

RAIGIRI, a town of Hindoostan, in Golconda; 10 miles S.E. of Beder.

RAIGUR, a town of Hindoostan, in the catarc of Sumbulpour; 15 miles N. of Sumbulpour.

RAJIK, a town of Syria, on the Euphrates; 18 miles S. of Bembig.

RAIL, in Architecture, is applied variously; particularly to those pieces of timber which lie horizontally between the pannels of wainscot, and over and under them. The word is also applied to those pieces of timber which lie over and under balusters in balconies, itairacles, &c. Also, to the pieces of timber that lie horizontally from post to post in fences, with pales or without. See Fence. Gaills, in a Shps, are long narrow pieces of fir, or oak, with mouldings of regular members of architecture stuck on them, which are fastened, or sometimes wrought from the solid plank, as ornaments to the shps' sides. The former are now discontinued in the navy, as they were found to rot the sides very much; the latter, wrought from the solid plank, are used in merchant ships. The rails of the head and ftern are pieces of oak timber handiomed wrought with mouldings. The lower rail along the fide is named the noafll-rail, and the next above it the fnee-rail, which are generally placed parallel to the top timber line, the fnee-rail with the top of the fide amidships, and the wail-rail about twenty inches below it; the rails next above and parallel to the fnee-rail are called drift-rails, and the rails above the plank-flee, if any, the fite-rails. The rails of the head are distinguished by the upper or main-rail, the middle and the lower-rail; and the rails of the ftern take their names from the parts to which they are fixed, as the fack-rail, lower counter-rail, upper counter-rail, foot space-rail, brace-rail, taffarel-rail, and taffarel fite-rail. (See Plate 1. Ship-building.) To these may be added the thwarship pieces of the framing of the great cabin bulk-heads.

Raills of the head are certain curved pieces of timber, extending from the bows on each side to the continuation of the ship's item, to support the knee of the head, and the ornamental figure fixed upon it.

Rail, or Water-Rail, in Ornithology, the name of the rallus aquaticus of authors, which is a bird of a long fnder body, with short concave wings. The bill is fnder, slightly incurvated, and one inch three quarters long; the upper mandible black, edged with red, the lower orange-coloured; the irides red; the head, lind-part of the neck, the back and covert of the wings and tail are black, edged with an olive-brown; the fale of the wing is white; the quill-feathers and secondaries fdlty; the throat, breast, and upper part of the belly, are afh-coloured; the fides under the wings, as far as the rump, fdlly varied with black and white bars; the tail is very fhort, conflifting of twelve black feathers; the ends of the two middle fipt with rail colour; the feathers immediately beneath the tail white; the legs are placed far behind, and are of a dully fhck colour; the toes very long, and divided to their origin. The bill is beakshaped, with the fides not webbed, it takes the water, will swim on it with much efue, but is often observed to run along the surface. It delights flesh in flying than in running, which it does very fwtily along the edges of brooks covered with rushes. When it runs, it every now and then lifts up its tail, and in flying hangs down its legs. Pennant.

This bird, fays Mr. Pennant, is properly fui generis, agreeing with no other, but forming a feparate tribe; though M. Briffon and Linneaus place it with the land-rail, and Mr. Ray with the water-hens. It is a well-tailed bird.

Rail, Land, the rallus crex of Linneaus, is a migrating bird, with a fhort, ftrong, thick bill; always found among corn, grafs, broom, or fucre. It leaves this kingdom before winter. They have long legs, and a fingular note, reembling the word crex, often repeated. The feathers on the crown of the head, hind part of the neck, and the back, are black edged with gray colour; the covert of the wings of the fame colour, but not spotted; the tail is fhort and of a deep bay, the belly white, and the legs afh-coloured. They are in great fteent in Anglesea, where they appear about the 2oth of April, fupposed to pafs over from Ireland, where they abound. They are found in molt of the Hebrides, and the Orkneys. Pennant.

Railling, in Rural Economy, a fort of fence conftructed with pefts and rails. It is often made use of in protecting young hedge fences, from the cropping of cattle or other animals. Any fort of coarse timber does very wel for this lat purpose, luch as outside pefts, and the boughs or loppings of timber plantations. See Fence.

Railery, as Dr. Johnson hath defined it, denotes flight fattire, or fatical merriement; and a beautiful writer compares it to a light which dazzles, and which does not burn. It is sometimes, what it aways ought to be, innocent and pleasant, but it is too frequently offensive. Railery is of various kinds; ferior, severe, and good-humoured; there is a kind which perplexes, a kind which offends, and a kind which pleases.

It has been fully obferved, that in order to rally well, kindnefs should prevail in every thing that is faid, as the characfer of a friend fhould be maintained to warrant freedom with a perfon who is addrefed, especially in this way. Al- lulions to past follies, and hints that tend to revive what a perfon wishes for ever to forget, fhould never be introduced as
as subjects of railery. It is below the character of persons of humanity and good breeding, to indulge mirth, while any one in the company is suffering, as the effect of that mirth, pain and mortification.

**RAILWAY, Tram or Dram-road, or Wagon-way, in Rural Economy.** A track constructed of iron, stone, timber, or other material, upon the level surface of an inclined plane, or other situation, for the purpose of diminishing friction, and thus serving for the easy conveyance of heavy loads of any kind of articles. See Plate IV. Canals, figs. 31 to 35. See also CANAL.

It has been remarked, that railways have hitherto been confined, almost exclusively, to coal-works, and other mines; and that inventions, wholly on recommendations are simplicity and usefulness, are often suffered to lie long in a state of public neglect; while others, perhaps, of no real utility, but of more imposing aspect, and being perniciously blazoned forth by interested or blinded partisans, are readily adopted; and bas'd, for a while, in the sunshine of public favour. The time has, however, at length arrived, when carriages moving on level surfaces, or on gently inclining planes, with little friction, and without obstructions, are fast spreading over the face of the country. It has been observed that there may be many line-works, as well as other forts, from which railways may be laid, in different directions, with great benefit to their proprietors and the surrounding neighbourhoods in general.

With the view of diminishing horse labour, it has been suggested by Dr. Anderson, in his Recreations in Agriculture, that where internal canals cannot be established, this may be effected, and intercoure facilitated, by means of railways, which have not yet been introduced into general practice. It is further stated, that they were first solely employed for transporting coals to a moderate distance from the pits, to the places where they could be shipped, being universally made of wood. And long, says he, had they been applied to this use, without any idea having been entertained that they could be employed for more general purposes. By degrees they were, however, carried to a farther extent; the icarity of wood, and the expense of their repairs, suggested the idea of employing iron for the purpose of improving these roads. At the first, flat rods of bar-iron were nailed upon the original wooden rails, or as they were technically called, *fleeperis*; and this, though an expensive process, was found to be a great improvement. But the wood upon which these relied being liable to rot and give way, some imperfect attempts were made to make them of cast iron, but these were found to be liable to many objections, until the buffers was taken in hand by Mr. Outram, engineer, at Butterly Hall, Derbyshire, who contrived at the same time, so far to diminish the expense, and improve the strength of the road, as to bring them to a degree of perfection, that no one who has not seen them can easily conceive could have been done. And it is added, that this having been carried into execution in a few cafes, and found to anwer, has been improved upon and simplified by practice, till it is now brought to such a state of perfection as to have given proofs, that it admits of being carried much beyond the limits of what was for many years conceived to be possible, and to afford demonstrative evidence, that it may in future employed to a wider extent still, to which no limits can be at present assigned or foreseen.

There are a great number of railways in Derbyshire, Shropshire, Lancashire, and many other parts of the country. In the first of the above counties, there are railways of very different lengths; one of five miles in length, leading from the town of Derby to the collieries in the vicinity; another, from the lime-stone rocks on the Cranford canal, called the Crick railway, which is about one mile and a half in length; a third from the Beggarlee colliery to the same canal, denominated Barber and Walker's railway, of similar length; a fourth from the lime-works in the neighbourhood of Bolton, to the canal near Whaley bridge, termed the Peak-forest railway, which is about six miles in length; a fifth called the Marple railway, of about one mile and a half long, on the Peak-forest canal; &c. A railway over Blifworth-hill near Nottingham, on the Grand Junction canal, which are three miles and a half in length, and constructed in a double manner; a seventh, which has the name of the Ashby de la Zouch railway, has four miles of double and eight miles of single rails. Some of these railways are formed in a very complete manner, especially those which have been made since the various improvements of them were introduced. They have been of prodigious utility and advantage to the county, both in regard to its agricultural improvements and its manufacturing interests and concerns.

These forts of railway roads have likewise been introduced into many parts of the county of Salop, with vast benefit and success to the different interests of the district. They have here had a new application, in being employed for the purpose of conveying heavy weights from different levels on canals.

Speaking of the great utility of canals in the carriage of various articles in this county, it is observed by Mr. Telford, an able engineer, that another mode of conveyance has frequently been adopted to a considerable extent; which is that of forming roads by means of iron rails laid along them, upon which materials are carried in waggons, which contain from fix to thirty hundred weight; experience, he thinks, has now convinced us, that in countries the surfaces of which are rugged, or where it is difficult to obtain water for lockage, where the weight of the articles of the produce is great in comparison with their bulk, and where they are mostly to be conveyed from a higher to a lower level, that in those cases, iron railways are in general preferable to canal navigation.

It is supposed, that on a railway well constructed, and laid with a declivity of fifty-five feet in a mile, one horse will readily take down waggons containing from twelve to fifteen tons, and bring back the same waggons with four tons in them. This declivity, therefore, suits well, when the imports are only one-fourth part of what is to be exported. If the empty waggons only are to be brought back, the declivity may be made greater; or an additional horse applied on the returning journey will balance the increase of declivity. If the length of the railway were to be considered, it may, it is supposed, without much inconvenience, be varied from being level to a declivity of one inch in a yard, and by dividing the whole distance into separate flages, and providing the number of horses suitable for each portion of railway, according to the distance and degree of declivity, the whole operation may be carried on with regularity and dispatch.

It is upon the whole believed, that this useful contrivance may be varied so as to suit the surface of many different countries, at a comparatively moderate expense. It may be constructed in a much more expeditious manner than navigable canals; it may be introduced into many districts where canals are wholly inapplicable; and in case of any change in the working of mines, pits, or manufactories, the rails may be taken up and laid down again in new situations, at no very great expense or trouble.

It is also further noticed, that some parts of this and the neighbouring counties, in which canals had once been intended
intended to be formed, have since been looked over and examined with the view of having iron railways instead of navigable cuts; and in many cases this may be the most advisable and proper, particularly in all situations where difficulties arise in the constructing of navigable canals, or other forts of works for water carriage.

The county of Lancaster, too, has a great many of these iron railways for the convenience, accommodation, and advantage of the different collieries, manufactories, and other works, where heavy loads are to be transported. The coal works near St. Helens, in the vicinity of Liverpool, has a double railway some miles in length; and at the iron-works of lord Belcarra, near Wigan, as well as his canal coal pits near the same place, there are double railways of very considerable length. To the south of the town of Preston, at a small distance from Bambrigg bridge, there is likewise one communicating with the Lancaster and Kendal canal, which is also double and of great length; serving to convey the coals from the southern parts of the county to that canal, in order to their distribution in the northern parts, and the adjoining districts.

On the east side of the same county they also prevail in many places, and are found of the greatest use, being the means of dispatching much business in a ready manner and without much expense of labour.

The utility of these railways has been found to be extremely great in other coal-works and canals, where they are at present very extensively employed; and it has been suggested, that they may be applicable in other cases, as for shortening the team labour of a farm so as to bring it within one day's journey, where more than one were formerly necessary, by which a great saving in labour and expense may be made. Also, in rendering the business of lime works more easy and expeditious in different instances. It has likewise been hinted by Mr. Beatfon, in the first volume of Communications to the Board of Agriculture, that they might be had recourse to on roads where there are unavoidable rises or falls, for taking up or letting down heavy loaded waggons or other carriages. It is observed, that near Colebrough Dale there is one at a small distance from the iron bridge, upon which loaded boats are drawn up to a canal, two hundred and twenty feet above the level of the river Severn, and let down in a similar manner into it, by which means twenty-two locks are saved, and the work executed in an expeditious manner. It is supposed, that this is the greatest inclined plane in Europe, or perhaps in the world, for though they are much used in China in the place of locks, has he never heard of any of them being equal in height to this. The rails are best made of iron. It is added, that they have been found useful in improving soft, molly, boggy lands, on which horses cannot travel; a rail road of this fort having been formed through a peat moss near Manchester by Mr. Wakefield, while it was under improvement, at the expense only of about three hundred pounds a mile, on which a single horse was capable of drawing the greatest facility seven wagons at once, each being loaded with about seven hundred weight of marle, bearing in the whole forty-nine hundred weight, and with the weight of the wagons upwards of three tons. This was performed, it is observed, over a place where a few months before a dog could hardly venture without the danger of being drowned. On the Ketley and other canals in the county of Shropshire, vast advantages have been derived from laying railways upon inclined planes, and letting down and drawing up the different articles by means of machinery, as may be seen in the very able Agricultural Report of that district, where excellent representations of them are given.

Besides these different cases of railways, another has been suggested by the writer of the Annals of Agriculture, which is that of having them laid from the stack-yards to the threshing machines, by which the grain may be conveyed to them at any time with ease and convenience, as well as any particular stack that may be wanted.

It is further stated by the ingenious Dr. Anderson, that the best idea he can give of the benefit that may result to the community from the use of this kind of railways, will be from stating some facts respecting them, which were lately communicated to the Society of Arts by Mr. Wilkes, of Measham, near Loughborough, in Leicestershire; a spirited and judicious agriculturalist. He had a railway of this fort made, which was about five miles in extent, leading from a coal-mine to a market. He found it so fully to answer his expectations after it was finished, that he communicated to the above society an account of some trials he had made of it, requesting that such of the members of that respectable institution as were foreigners of information on that head, would do him the honour to witness some experiments that he wished to make upon it, for the information of the public. A committee of the members was accordingly appointed for that purpose, and before them he shewed that a moderate sized horse, of about twenty pounds value, could draw upon it with ease down hill (the descent being one foot in a hundred) thirty-two tons, and without much difficulty forty-three, and seven tons up hill, independent of the carriages. The doctor concludes from these facts, that upon a perfect level a horse could draw with ease from ten to twenty tons. It is observed, that Mr. Wilkes's railway, on which the experiments were made, was, from local circumstances, laid upon wooden sleepers, and is not fo perfect as those done upon stone. But it is added, that twenty tons are the load which such a horse could draw with ease, travelling at the usual waggon rate, in boats upon a canal; so that the number of horses required in this way will not be much, if at all, greater than on a canal.

Certain advantages attach to this mode of conveyance, which do not so well apply to a canal, and more perfect; but it is not his intention to draw a parallel between these two modes of conveyance. Nobody can entertain any doubt, he thinks, about the utility of canals where they are easily practicable. He only wishes to point out this as an eligible mode of conveyance where canals cannot be conveniently adopted.

It is further remarked, that it was customary at the first, to put the whole load to be drawn by one horse upon railways into one waggon; but now, when the load is 100, much augmented, it has been found eligible to divide it into many parts, so that no one waggon shall carry more than one or two tons; by this method the weight is so divided, that the pressure is never so great upon one point as to be in danger of too much crushing the road; the carriages can be made much more limber and light in all their parts, and they are much more easily moved, and more manageable in all respects than they otherwise would have been. And another advantage of this arrangement, which defers to be particularly adverted to, is, that it admits of shifting the carriages so as to leave a load, as it were, in parcels at different places where they may be required, without trouble or expense. This, when it comes to be fully understood and carried into practice, will, he thinks, be a convenience of invaluable value, a thing that has been always wanted, and never yet has been found though it has been diligently sought for. The able writer has here endeavoured to illustrate its importance and utility in transporting goods from the wet docks now forming on the Isle of Dogs to London, and in carrying roads to different distant parts of the country; in which cafes,
RAILWAY.

eas, and in all where there is much business to be done, they would require to be double, one for going, and the other for coming upon, to prevent interruption and interference.

And he afterwards offers a few remarks, tending to shew the practicability of the measure, and to guard against setting out upon a bad plan, which might, he supposes, in time to come, frustrate the good that might have resulted from the undertaking; merely premising, that he propos'd these railways solely for the purpose of conveying weighty loads, leaving the roads, as at present, open for coaches and light carriages.

Also with a view to discover how far it may be practicable to introduce these iron railways into general use, he has made some inquiries respecting the expense of making them; and although this must vary according to the abundance and goodness of materials, and other circumstances, the following statement may serve to give some general notions on that head. In the most eligible situations, where materials are abundant and good, and circumstances favourable, the lowest expenditure at which a single railway of this kind can be made, will be about one thousand pounds a mile. But as a single railway must be liable to great inconveniences, unless under very particular circumstances, double railways ought to be considered as the only useful fort. These, for public purposes, according to the opinion of the inventor, should be very substantially made. The metal used should be of the finest sort, and of substance enough, not merely to carry the weights proposed, but to be equal to bear almost any blow or shock that they may be likely to experience; and, thus made, what they will lose by rust or wear, will be long ere it materially weakens them. Made after such a manner, in favourabe situations in the country, a double railway may, he thinks, cost about two thousand pounds a mile, but in the neighbourhood of London, where the charge of everything is high, and where they should be of the strongest fort, we should suppose they might cost nearly three thousand pounds a mile. It is bad economy, he thinks, to fave on articles of this fort at the first; for the little expense thus laid out then will be much in repairs: how small these repairs are, may be imagined from this circumstance, that when a road is thus made, the undertaker does not scruple to supply all that are broken, free of charge, for the first three years. Say then that such a road cost three thousand pounds a mile, this would bring a charge upon the turnpike of 150l. a-year, say 50l. more for annual repairs; this is, in all, 200l. per annum. Compare this with the expense of keeping the present roads in repair. It has been suggested to him, that there is annually laid out in repairs upon the road from Hyde Park Corner to Hounslow, considerably above one thousand pounds a mile; so that the difference of expense is, even at the beginning, very much in favour of railways: and were the money thus at first expended to be gradually paid off, the tolls might thus be lowered almost to nothing. And, he thinks, that a turnpike road cannot be made in almost any situation for less, as he is told, than 1000l. per mile; but where it is of considerable width, as near great towns, it will run from 1500l. to 2000l. per mile; and in annual repairs, including the purchase price of materials, carting them on the road, spreading, raking off, and carting away, again, from 100l. to 1000l. a mile. Say 1500l. prime cost, the interest is 35l. and 150l. for repairs, the annual charge of such road would be 225l. This is an expense of 100l. 5s. 4d. more than the other. But for the present, let us suppose that they will be equal, the extra charge for purchasing ground for a new waggonway, &c. being equal to that surplus; let us now see what would be the difference of charge to the employers of these waggon to the same amount pafs each day, carrying fix tons each, drawn by eight horses; these, at one shilling each waggon for toll (or two-pence a ton), would produce 5l. a day, or 185l. a year; which, at the rate of eight miles for each turnpike, would be 228l. per mile, the farplus being produced by road horses and light carriages. The charge to the employer, for this stage, must be 182l. and the keep of 800 horses, besides servants, incidental charges, and owner's profits for the transport of 660 tons of goods a day. Say that the same horses travel two stages a day, the turnpike money would be doubled; that is, 365l. per annum; the keep of 800 horses, at 2l. each per diem, is 20,000l. These sums added make 32,850l.; owner's profit and incidental charges, say 10 per cent., 3285l.; in all 36,135l., or, on 219,000l., being 600 tons a day, about one-fourth per ton. And supposing the fame quantity of goods carried on the railway, and the same turnpike money paid, and that each horse drew only fifteen tons, this would require only, he thinks, forty horses; the keep of which, at 2l. a day, would be 1460l.; add the toll, 1825l. is 3285l. per annum. Owner's profit, &c. upon this sum 10 per cent. as above, 3285l.; in all 36135l., or about four-pence a ton, just one-tenth part of the charge in the other case. He thinks, that when the object comes to be considered in this point of view, few measures that can be proposed will hold forth such an important national improvement as this would be. Considered with regard to the consumption of the produce of the earth (an object at present deferring the fullest attention, as this improvement can be applied to almost every part of the country), it would, he supposes, reduce the number of heavy road horses to one-eighth part of what they are at present, and of course augment the number of cattle or other consumable provisions in a proportionate degree, so as greatly to lower the price of the necessaries of life. It would, in the next place, lower the price of the carriage of goods of all kinds to an amazing extent; and lastly, as a consequence of that, it would give such encouragement to agriculture, as no other measure that can be contrived could ever effect, and that without confining such a thriving expense to any one individual, or to the state. On the contrary, by inducing cheapness of provision, and affording such efficacious encouragement to manufacturers and to agriculture, it would produce a general prosperity, which, by augmenting the consumption of taxable commodities, would augment the public revenue; while, at the same time, every individual would feel himself relieved from the prelude of many taxes that prove distressful to him at present. After justly reproving every sort of gambling speculations by moneyed men in undertakings of this nature, and shewing the numerous evils that attend them, he advises it, as highly necessary to prevent these railways from ever becoming private property, on any account, to keep them open and patent alike, to all who shall choose to employ them as a king's highway, under such regulations as it shall be found necessary to subject them to by law. In short, they should, he thinks, be put upon the same footing, in all respects, as public roads are at present, only under the direction of a distinct set of commissioners, who should have the superintendence of everything that concerns this species of roads only. These commissioners should be vested with authority under an act of parliament, to erect turnpikes upon them, to levy certain stipulated tolls, and to mortgage the produce of these tolls for the purpose of raising money to be applied in the necessary purchases of land, and making the roads. In the act it should
should be expressly stipulated, that the produce of these tolls should be applied solely to keeping the road in repair, paying the interest of sums borrowed, and clearing off the principal as fast as the collections would admit; and when the whole money borrowed was thus paid off, the tolls should be so lowered as only to produce money sufficient to keep the roads in a state of continually good repair. This would be the expense of transporting goods be annually diminishing, and the prosperity of the country be thereby augmenting from day to day. He adds, that he is particularly earnest in this business, as he has not been an uncounseled observer of the effects that have resulted from the establishment of turnpike roads in Scotland, which were begun within his recollection; and these effects have been such as no man who had not seen it would have believed could ever have taken place. Distance may be said to be thus diminished from place to place; lands that were originally far beyond the influence of the town as a market for any thing else than live-stock, are thus brought, as it were, close to its gates; and the value of the produce of many articles is thus to them augmented fourfold, while they are at the same time diminished to the public. Not only is the value of produce raised, but the quantity also of that produce is augmented exceedingly by means of manures which become then accessible. Foulle manures, such as chalk, lime, and marle, which were formerly confined to a narrow spot, expand themselves as if it were by a magical power, and by that expanisible influence diffuse around fertility, riches, and plenty.

Coal's and other weighty articles that may be useful in arts or manufactures of various kinds, which never were, nor ever could have been of any value to the owners of them, so long as the expense of transportation exceeded a certain sum, find a ready market to any extent as soon as the price falls below that rate, thus contributing not only towards the enriching of the owners, but to the furnishing of employment to the various persons who must be engaged in preparing or transporting them to market, and the universal accommodation of the whole. Around every market you may suppose a number of concentric circles drawn, within each of which certain articles become marketable which were not so before, and thus become the source of wealth and prosperity to many individuals. Diminish the expense of carriage but one farthing, and you widen the circle; you form, as it were, a new creation, not only of itones, and earth, and trees, and plants, but of men also, and what is more, of industry, of happiness, and joy. It is added, that by making these roads the property of the public, and free to every person to bring his own waggons upon them where he pleased, farmers, when near them, would make by roads of the fame fort leading into these from their respective premises; the inhabitants of villages and country districts would join together, and at one common expense make roads of the same fort leading to a greater distance inwards, as they now make bye roads for themselves. Thus would all be accommodated; those who had business enough to furnish a sufficient load for one horse might go to market with it when they pleased: those who had dealings on a smaller scale could have one, two, or more waggons of their own conjoined with those of others to make up a load for one horse: and those of still smaller means could have one wagggon loaded with the joint articles belonging to two, three, or more. A ton weight might then be pushed before a man to market for many miles, as a wheelbarrow is now. It is scarcely possible, he supposes, to contemplate an infitution from which would result a greater quantum of harmony, peace, and comfort, to persons living in the country, than would naturally result from this arrangement. In fact, he says, no one measure, that would tend to effectually to lower the price of the necessaries of life, and restore abundance.

In what regards the method of forming and constructing these railways, it is observed by the same writer, that the following has been given by the inventor as the most improved plan: first, that the best line the country affords should be traced out, having regard to the direction of the carriage of articles or trade to be expected; and if such trade be both ways in nearly equal quantities, a line as nearly horizontally as possible should be chosen. If the trade is all in one direction, as is generally the case between mines and navigation, then the most desirable line is one with a gentle gradual declent, such as should make it not greater labour for the horses employed to draw the loaded wagons down, than the empty ones back; and this will be found to be the case on a railway defending about one foot vertical in one hundred feet horizontal. Or, if the railway and carriages are of the very best construction, the defcent vertical may be to the length horizontal as 1 to 50, where there is little or no upgate loading. In cafes between mines and navigations the defcents will often be found greater than could be wished. On a railway on the improved plan, where the defcent is more than 1 to 50, fix or eight waggons, loaded with thirty or forty hundred weight each, will have such a tendency to run downwards, as would require great labour of one horse to check and regulate, unless that tendency was checked by lodging some of the wheels. On such, and steeper roads, iron flippers are applied, one or more to a gang of waggons, as occasion may require. Each flipper being chained to the side of one of the waggons, and, being put under the wheel, forms a fledge. Where the defcent is very great, steep inclined planes, with machinery, may, it is observed, be adopted, so as to render the other parts of the railway easy. On such inclined planes the defending loaded waggons being applied to raise the ascending empty; or partly loaded ones, the necellity of flegding the wheels is avoided; and the labour of the horse greatly reduced and lessened.

In order to obtain the desired levels, gentle declents, or steep inclined planes, and to avoid sharp turns, and circuitous tracks, it will often be found prudent to crofs valleys by bridges and embankments; to cut through ridges of land; and in very rugged countries short tunnels may, he thinks, sometimes be necessary. The line of railway being fixed, and the plans and sections by which the frame is to be executed and settled, the ground for the whole must be formed and effectually drained. The breadth of the bed for a single railway, should be, in general, four yards; and for a double one six yards, exclusive of the fences, fide drains, and ramparts.

That the bed of the road being so formed to the proper inclination, and the embankments and works thereof made firm, the surface must be covered with a bed of itones broken small, or good gravel, six inches in thicknes beyond. On this bed must be laid the sleepers, or blocks to balance the rails upon. These should be of stone in one place where it can be obtained in blocks of sufficient size. They should not be less than eight, nor more than twelve inches in thicknes; and of such breadth (circular, square, or triangular,) as shall make them 150lbs. or 200lbs. weight each. Their shape is not material, so as they have a flat bottom to rett upon, and a small portion of their upper surface level, to form a firm bed for the end of the rails. In the centre of each block should be drilled a hole, an inch and a half diameter, and six inches in depth, to receive an octagonal plug of dry oak, five inches in length; for it should not reach the bottom of the hole; nor should it be larger than the nice to put in easily.
cally, and without much driving; for if too tight fitted it
might when wet burl the stone. These plugs are each to
receive an iron spike or large nail, with a flat point and long
head, adapted to fit the counter-funk notches in the ends of
two rails, and thereby to fasten them down in the proper
position, or situation in which they are to lie.

With regard to the rails, they should be of the round
iron, one yard in length each, formed with a flange on
the inner edge, about two inches and a half high at the ends,
and three and a half in the centre; and shaped in the bell
manner to give strength to the rails, and keep the wheels in
their track. The sides of the rails, for general purposes,
should not, he thinks, be less than four inches broad; and
the thickness proportioned to the work they are intended
for. On railways for heavy burdens, great use, and long
duration, the rails should be very stout, weighing 40 lbs.,
or, in some cases, nearly half an hundred weight each. For
railways of less consequence, less weight of metal will do;
but it will not be prudent to use them of less than 30 lbs.
weight each, in any situation exposed to breakage above
ground. But it is observed that in mines, and other works
under ground, where very small carriages only can be em-
ployed, very light rails are used, forming what are called
train roads, on a system introduced by Mr. Carr; and these
kinds of light railways have been much used above ground
in Shropshire, and other counties where coals and other
minerals are obtained.

It is added, that in fixing the blocks and rails great atten-
tion is required to make them firm. No earth or soft ma-
terials should be used between the blocks and the bed of small
stones or gravel, on which the rails must all be fixed by an
iron gage, to keep the fides at a regular distance, or parallel
to each other. The belt width of road for general purposes
is four feet two inches between the flanches of the rails; the
wheels of the carriages running in tracks about four feet five
inches acnder. Rails of particular forms are necessary
where roads branch out from or intersect each other; and
where carriage roads cross the railways; and, at turnings of
the railways, great care is required to make them perfectly
easy. The rails of the fide forming the inner part of the
curve should be fixed a little lower than the other; and
the rails should be let a little under the gage, so as to
bring the fides nearer together than in the straight parts;
these deviations in level and width to be in proportion to the
sharpness of the curve. The blocks and rails being fixed and
spiked fast, nothing more remains to be done than to fill the
hoie-path, or space between the blocks, with good gravel,
or other proper materials; a little of which must also be put
on the outside of the blocks to keep them in their proper
places. This gravel should always be kept below the sur-
face of the rails on which the wheels are to run, to keep the
tracks of the wheels free from dirt and obstructions. The
form of the rails must be such as will free them from dirt if
the graveling is kept below their level.

And in the constructing of the carriages great attention to
avoid friction is necessary, particularly in the formation
of the wheels and axles, which must be adapted to the form
of railways and kind of loading; but for which general direc-
tions cannot be given in a narrow compass. It is prob-
able that this valuable invention may also be applicable to
many other purporses in agriculture or manufactures, as it
becomes more generally known, and the facilities which it af-

fords are better known. See Canal.

RAIMALPOUR, in Geography, a town of Hindostan, in
Rohilcund; 30 miles S. of Berilly.

RAIN, a town of Hindostan, in Guzerat, on the gulf
of Cutch; 45 miles W. of Noanagur.—Alfo, a town of
Bavaria; 16 miles N. of Augsburg. Lat. 43° 37'. E.
long. 10° 52'.

RAIN, or Old Rain, a town of Scotland, in Aberdeens-
shire, near which are the remains of a palace of the former
bishops of Aberdeen; eight miles S. E. of Inverary.

RAIN, the dissipation of water which descends from the
atmosphere in drops of various sizes. By this circumstance
rain is distinguished from dew or fog; in the former of
which the drops are so small, that they are quite invisible;
and in the latter, though they are of a larger size, they
seem to have little more specific gravity than the atmos-
phere itself, and may therefore be reckoned hollow spherules
rather than drops.

Rain is, apparently, a precipitated cloud; as clouds are
nothing but vapours raised from moisture, waters, &c.

And vapours are demonstratively nothing else but little
bubbles or vesicle detached from the surface of the ter-
restrial globe by the power of the solar or subterraneous heat,
or some other cause. These vesicle, being specifically
lighter than the atmosphere, are buoyed up by it, until they
arrive at a region where the air is in a state of balance with
them; and here they float, till by some new agent they are con-
verted into clouds, and thence either into rain, snow, hail,
mist, or the like.

But the agent in this formation of the clouds into rain,
and the vapours into clouds, has been much controverted.
Some philosophers have supposed that the cold, which con-
stantly occupies the superior regions of the air, chills and conden-
ses the vesicle, at their arrival from a warmer quarter; con-
gregates them together, and occasions several of them to coa-
dele into little malfes: and by these means their quantity of
matter increasing in a greater proportion than their sur-
face, they become an overbalance to the thin air, and ac-
cordingly descend in rain.

Dr. Derham accounts for the precipitation thus: that the
vesicle being full of air, when they meet with a colder
air than that they contain, this internal air is contracted into
a less space; and consequently the wettery shell, or case,
is rendered thicker, so as to become heavier than the
air, &c.

It has, however, been objected to this hypothesis, that
rain often happens in very warm weather; and though it be
allowed, that the condenfation may be owing to the cold
of the upper regions, yet the drops acquire a considerable
increase of size as they descend. E. G. On the summit of
a hill they are small and occasion only a drizzling shower;
but in descending the hill it becomes more considerable, and
at the bottom of the hill the drops are much larger, and the

RAI
the rain is impetuous. Hence it appears that the vapours are condensed when the atmosphere is warm as well as when it is cold.

Others only allow the cold a part in the action, and ascribe a share of it to the winds, alleging, that a wind blowing against a cloud will drive its vesture upon one another, by which means several of them, coalescing as before, will be enabled to descend; and the effect will be still more considerable, if two opposite winds blow together toward the same place. To which they add, that clouds already formed, happening to be augmented by fresh accretions of vapour, continually ascending, may on this account be enabled to descend.

Against the above stated hypotheses of Derham, it has been objected that the vesture of vapour, if they be such, are filled, not with air, but fire or heat in a latent state, and till they part with this heat, the vapour cannot be condensed. Cold is not always sufficient to produce this effect; for in the most severe frosts the air is rare, and parts with little or none of its vapours, for a considerable time. It is also alleged, that the winds have no considerable agency, since blowing upon vapour is so far from condensing it, that it unites more closely with the air; and wind is known very much to promote evaporation. See VAPOUR.

Yet the grand cause, according to Rohault, still remains: that author conceives it to be the heat of the air, which after continuing for some time near the earth, is at length carried up on high by a wind, and there thawing the snowvilli, or flocks of the half-frozen velicula; reduces them into drops; which coalesce, descend, and have their dilatation perfected in their progress through the lower and warmer flages of the atmosphere. Others, as Dr. Clarke, &c. ascribe this descent of the clouds rather to an alteration of the atmosphere than of the velicula; and suppose it to arise from a diminution of the spring, or chalybea force of the air.

This elasticity, which, as they say, depends chiefly or wholly on the dry terrene exhalations, being weakened, the atmosphere sinks under its burden, and the clouds fall, on the common principle of precipitation.

Now, the little vesture, by any or all these means, being once upon the deficient, will pervert therein. notwithstanding the increafe of resistance they every moment meet with in their progress through flill denser and denser parts of the atmosphere. For, as they all tend toward the equal point, viz. the centre of the earth, the farther they fall, the more cohesion will they make; and the more cohesion, the more matter will there be under the same surface; the surface only increasing as the squares; but the solidity as the cubes; and the more matter under the same surface, the less friction or resistance there will be to the same matter.

Thus if the cold, the wind, &c. happen to act early enough to precipitate the ascending vesture, before they are arrived at any considerable height, the coalescences being few in fo short a descent, the drops will be proportionably small; and thus is formed what we call DEW. See DEW.

If the vapours prove more copious, and rise a little higher, we have a MIST or FOG; which see respectively.

A little higher still, and they produce a small rain, &c. If they neither meet with cold, nor wind enough to condense or dissipate them, they form a heavy, thick, dark flky; which lasts sometimes several weeks. This hypothesis of the diminution of the atmosphere's elasticity, requires a more satisfactory explanation of the cause of this diminution. By ascribing it to terrene exhalations, we only solve one difficulty by introducing another; for we are totally unacquainted with the nature and operation of these exhalations. But let the cause be what may be supposed, if it act equally, and at once, upon all the vapour in the air, all that vapour must be at once precipitated; and the consequence must be, that instead of gentle showers continuing for a considerable time, we must have copious water-spouts, lasting only for a few minutes or seconds, which, instead of refreshing the earth, would drown and lay it waste.

Those who assign both of the above hypotheses, account for many of the phenomena of the weather; e.g. why a cold is always a wet summer, and a warm a dry one; because the principle of precipitation obtains in the one case, and is wanting in the other. Why we have ordinarily most rain about the equinoxs; because the vapours arise more plentifully than ordinary in the spring, as the earth becomes loosened from the brumal constrictions; and because, as the fun recedes from us in autumn, the cold increasing, the vapours that had lingered above during the summer heats, are now dispatched down, &c. Why a settled, thick, close sky fiercely ever rains till it has been first clear; because the equally diffused vapours must first be condensed, and congregated into separate clouds, to lay the foundation of rain; by which means the reft of the face of heaven is left open, and pervious to the rays of the sun, &c.

For other phenomena of rain, as they relate to the weather-glass, see BAROMETER, and WEATHER. It cannot be doubted, that there is a connection between the deficit of the barometer and the fall of rain; but no satisfactory reason has yet been assigned for the circumstance; nor is it possible to foretell with certainty that rain will follow any changes in the height of the barometer that have been observed. The immediate dependence of rain, or of any other atmospheric phenomena, on the influence of the moon, appears to be rendered highly improbable, not only by mathematical calculations of the effects of the moon's attraction, but also by the irregularity of the observations which have been adduced in favour of such a connection. (See Influence of the Moon.) But however uncertain the ultimate causes of rain may be in general, their effects in some places are sufficiently constant, to be attributed to permanent local circumstances, and in particular to the periodical recurrence of similar winds.

For a more particular account of other theories, for explaining the ascent of vapours, the formation of clouds, and the fall of rain, see VAPOUR.

Besides the causes of rain, mentioned above, Desaguliers thinks it owing to the loss of electricity in the vapours of which they were formed.

Other writers, in the progress of this part of philosophical science, have considered rain as an electrical phenomenon; or at least they have supposed, that the powers of electricity may concur with other causes in producing it. Sienior Beccaria, whose observations on the general state of electricity in the atmosphere have been more extensive and accurate than those of any other person, reckons rain, hail, and snow, among the effects of a moderate electricity in the atmosphere. Clouds that bring rain, he thought, were produced in the same manner as thunder clouds, only by a moderate electricity. He describes them at large, and the resemblance which all their phenomena have to those of thunder-clouds is very striking. He notes several circumstances attending rain without lightning, which render it probable, that it is produced by the same cause as when it is accompanied with lightning. Light has been seen among the clouds by night in rainy weather; and even by day rainy clouds are sometimes seen to have a brightnes evidently independent of the sun. The uniformity with which
which the clouds are spread, and with which the rain falls, he thought, were evidences of an uniform cause like that of electricity. The intensity also of electricity in his apparatus generally corresponded very nearly to the quantity of rain that fell in the same time. Sometimes all the phenomena of thunder, lightning, hail, rain, snow, and wind have been observed at one time; which shows the connection they all have with some common cause. Signior Beccaria, therefore, supposes, that, previous to rain, a quantity of electric matter escapes out of the earth, in some place where there was a redundancy of it; and in its ascent to the higher regions of the air, collects and conducts into its path a great quantity of vapours. The same cause that collects, will condense them more and more; till, in the places of the nearest intervals, they come almost into contact, so as to form small drops; which, uniting with others as they fall, come down in rain. The rain will be heavier in proportion as the elafficity is more vigorous, and the cloud approaches more nearly to a thunder-cloud. He imitated the appearance of clouds that bring rain, by inflating himself between the rubber and conductor of his electrical machine; and with one hand dropping collophonia into a spoon fastened to the conductor, and holding a burning coal, while his other hand communicated with the rubber. In these circumstances the smoke spread along his arm, and, by degrees, all over his body, till it came to the other hand that communicated with the rubber. The lower surface of this smoke was every where parallel to his clothes, and the upper surface was swelled and arched like clouds replete with thunder and rain. In this manner, he supposes, the clouds that bring rain diffuse themselves from over those parts of the earth which abound with electric fire, to those parts that are exhausted of it; and by letting fall their rain, restore the equilibrium between them. Signior Beccaria also thought, that the electricity communicated to the air, which both receives and parts with it slowly, would account for the retention of vapours in a clear sky; for small disjointed clouds, not diffused into rain; for the smaller and lighter clouds in the higher regions of the air, which are but little affected by electricity; and also for the darker, heavy, and sluggish clouds in the lower regions, which retain more of it. He even imagined that some alteration in the weight of the air might be made by this electricity of it: the phenomena of rain, he thought, favoured the supposition, that the electric matter in the air did, in some measure, leffen its pressure: for when the electric matter is actually in the air, collecting and condensing the vapours, the barometer is low. When the communication is made between the earth and the clouds by the rain, the quicksilver begins to rise; the electric matter, which supported part of the pressure, being discharged. Lettre deI' Elecfricino. Priestley's Hist. &c. of Electricity, vol. i. p. 427, &c. 8vo.

Dr. James Hutton's theory of rain is stated and simply illustrated in the 1st volume of the Edinburgh Transactions, p. 47, &c. It is well known that atmospheric air is capable, with a certain degree of heat, of dissolving a given quantity of water. (See VAPOUR.) Dr. Hutton ascertains the ratio of the dissolving power of air, in relation to water, with different degrees of heat; and thus, by mixing a portion of transparent humid warm air with a portion of cold air, the mixture becomes opaque, and part of the water will be precipitated; or, in other words, the vapour will be condensed into rain. Hence he observes, that since the capacity of air for moisture increases faster than the temperature, there must be a depotation of moisture when two saturated portions of air at different temperatures are mixed. Dr. Hutton supposes that heat and solution do not increase by equal increments; but that, in reality, if heat be suppos'd to increase by equal increments along a straight line, solution will be exprest by ordinates to a curve, whose convex side is turned towards that line. That the power of solution is not increased in the same ratio with heat is, however, hypothetical, except when we rise pretty high in the scale, when its proportionate increase is some-what doubtful; nor has our author supported it by experiment. The condensation of the breath in air is not to the purpose, unless we suppos'e the air to be already fattened with vapour. In any view, it can only amount to this, that to render it visible, the heat must be diminished in a greater proportion than can be compensated by the power of solution in the body of air, in which the portion expired is at first immersed. In order to explain the origin of rain from this cause, we must always suppos'e a constant diminution of heat to take place at the moment of the condensation of the vapour; but we actually find, that the change from a state of vapour to the fluid state is attended with heat; so that rain must at once oppose its own cause, and continued rains would be impossible without the aid of other causes.

Dr. Hutton endeavours, from his own system, to explain the regular and irregular leasons of rain, with regard to either the generality of its appearance, or the regularity of its return. And to obviate the apparent exceptions of the theory, from the generality of rain, he explains the proportional quantities of rain, and adds a comparative effimate of climates, in relation to rain with the meteorological observations made in our own climate. As our limits will not allow our doing full justice to our author's reasoning, we must refer to his own paper on the subject. Mr. Dalton, in his "Meteorological Essays," (Eff. vi.) expresses his approbation of Dr. Hutton's theory in general; to this purpose, he says, "the principles of none appear to me to be more plausible and consistent with facts." Dr. Hutton, as we have above shown, considers the varieties of heat and cold, affecting the soluble power of the atmosphere, as the sole causes of rain; and Mr. Dalton observes, when we consider that evaporation and the precipitation of vapour are diametrically opposite, it is reasonable to suppos'e that they should be promoted by opposite causes: and as heat and dry air are favourable to evaporation, so cold, operating upon air replete with vapour, promotes its precipitation. Dr. Hutton, however, seems to consider water as chemically combined with the atmosphere, and that cold produces precipitation in a manner similar to what it does in water saturated with salt, or in other chemical processses; whereas Mr. Dalton suppos'es, that a portion of the vapour, consider'd as a distinct and peculiar fluid, is condensed into water by cold; but the effects resulting from the two theories will be the same. See METEOROLOGY, and VAPOUR.

M. de Luc, in the 2d volume of his "Thoughts on Meteorology," has directed particular attention to the various circumstances that attend rain. He has also examined the several hypotheses of different authors, and concludes, that they are altogether insufficient to account for the formation of it. In this inquiry the grand question under discussion is, what becomes of the water that rises in vapour into the atmosphere? or what is the state in which it subsists there, between the time of its evaporation, and its falling down in rain? If it continues in the state of water, as vapour, or such as is the immediate product of evaporation, it must possess the distinctive characters essential to that fluid; it must make
make the hygrometer move towards humidity, in proportion as the vapour is more or less abundant in the air: on a diminution of heat, the humidity, as shown by the hygrometer, must increase; and on an increase of the heat, the humidity must diminish; and the introduction of other hygroscopic substances, drier than the air, must have the same effect as an augmentation of heat. These are the properties of vapour, on every hypothesis of evaporation; and, therefore, all the water that exists in the atmosphere, without poffefling these properties, is no longer vapour, but must have changed its nature. M. de Luc fhews, that the water which forms rain, though it has ever been confidered and reafoned upon as producing humidity, does not poffefs this property, and must, therefore, have palled into another state. As he thinks that the vapour paffes into an invisible state in the interval between evaporation and its falling again in rain, and that in this state it is not fensitive to the hygrometer, he confiders the laws of hydrology as insufficient for explaining the formation of rain; but he does not pretend to have difcover'd the immediate caufe of the formation of clouds and rain. If it is not in the immediate product of evaporation that rain has its fource; if the vapours change their nature in the atmofphere, fo as no longer to be fensitive to the hygrometer, or to the eye; if they do not become vapour again till clouds appear; and if, when the clouds are formed, no alteration is perceived in the quality of the air; we muft acknowledge it to be very probable, that the intermediate state of vapour is no other than air, and that the clouds do not proceed from any distinct fluid contained in the atmofphere, but from a decomposition of a part of the air itself, perfectly similar to the reft. For other observations on the acfen and nature of vapour, and the subsequent formation of rain, we refer to the articles Meteorology, and Vapour.

As to the general quantity of rain that falls, and its proportion in several places at the fame time, and in the fame place at several times, we have many obfervations, journals, &c. in the Memoirs of the French Academy, the Philof. Tranf. and many other publications; from which we shall make the following extracts.

Upon measuring the rain falling yearly, its depth, at a medium, is found as in the following table.

The whole quantity of rain at London, in each of the years specified below, was as follows: viz.

<table>
<thead>
<tr>
<th>Year</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1774</td>
<td>26.328</td>
</tr>
<tr>
<td>1775</td>
<td>24.083</td>
</tr>
<tr>
<td>1776</td>
<td>20.354</td>
</tr>
<tr>
<td>1777</td>
<td>25.371</td>
</tr>
<tr>
<td>1778</td>
<td>20.772</td>
</tr>
<tr>
<td>1779</td>
<td>26.785</td>
</tr>
<tr>
<td>1780</td>
<td>17.313</td>
</tr>
</tbody>
</table>

Medium of these seven years 23.001

Proportion of the Rain of the several Seasons to one another.

<table>
<thead>
<tr>
<th>Year</th>
<th>Depth at Phil.</th>
<th>Depth at Uppmiller</th>
<th>Depth at Zurich</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>6.41</td>
<td>2.88</td>
<td>1.64</td>
</tr>
<tr>
<td>February</td>
<td>3.28</td>
<td>0.46</td>
<td>1.65</td>
</tr>
<tr>
<td>March</td>
<td>2.65</td>
<td>2.63</td>
<td>1.51</td>
</tr>
<tr>
<td>April</td>
<td>1.25</td>
<td>0.95</td>
<td>4.09</td>
</tr>
<tr>
<td>May</td>
<td>3.33</td>
<td>2.02</td>
<td>1.91</td>
</tr>
<tr>
<td>June</td>
<td>4.00</td>
<td>2.52</td>
<td>5.01</td>
</tr>
<tr>
<td>July</td>
<td>0.00</td>
<td>1.11</td>
<td>3.50</td>
</tr>
<tr>
<td>August</td>
<td>2.27</td>
<td>2.94</td>
<td>3.15</td>
</tr>
<tr>
<td>September</td>
<td>7.21</td>
<td>1.45</td>
<td>3.02</td>
</tr>
<tr>
<td>October</td>
<td>5.33</td>
<td>0.23</td>
<td>2.44</td>
</tr>
<tr>
<td>November</td>
<td>0.13</td>
<td>0.86</td>
<td>0.02</td>
</tr>
<tr>
<td>December</td>
<td>0.00</td>
<td>1.07</td>
<td>2.62</td>
</tr>
</tbody>
</table>

Half Year 36.76 19.24 32.66


As rain-gages have been fixed of late years in almost every part of the kingdom, we are enabled to determine, with considerable exactness, the depth of water which the rain yields in any given place. It may be observed, however, that inland counties have less rain than maritime ones, especially those which border on the western seas. But still a greater difference seems to take place between a mountainous country, and a champagne or flat country. In the former there often falls double or triple the quantity of rain in a year that there does in the latter, and never less than an equal quantity. It is also observed, that those winds bring most rain that blow from the quarter in which is the most and nearest sea; as are west and south-west winds. The rain-gage also shews, that more rain is collected in the instrument, as it is placed nearer the ground; without any appearance of a difference, between two places, on account of their difference of level above the sea, provided that the instrument is as far from the ground at the one place, as it is at the other. These effects are noticed in the Phil. Tranf. for 1769 and 1771, the former by Dr. Heberden, and the latter by Mr. Daines Barrington. Dr. Heberden says, "A comparison having been made between the quantity of rain which fell in two places in London, about a mile distant from one another, it was found that the rain in one of them constantly exceeded that in the other, not only every month, but almost every time that it rained. The apparatus used in each of them was very exact, and both made by the same artifit; and upon examining every probable cause, this unexpected variation did not appear to be owing to
to any mistake, but to the constant effect of some circumstance which, not being supposed to be of any moment, had never been attended to. The rain-gage in one of these places was fixed so high, as to rise above all the neighboring chimneys; the other was considerably below them; and there appeared reason to believe, that the difference in the quantity of rain in these two places was owing to this difference in the placing of the vellum in which it was received.

A funnel was, therefore, placed above the highest chimneys, and another upon the ground of the garden belonging to the same house, and there was found the same difference between these two, though placed so near one another, which had been between them, when placed at similar heights in different parts of the town. After this fact was sufficiently ascertained, it was thought proper to try whether the difference would be greater at a much greater height; and a rain-gage was therefore placed upon the square part of the roof of Westminster Abbey. Here the quantity of rain was observed for a twelvemonth, the rain being measured at the end of every month, and being taken that none should evaporate by passing a very long tube of the funnel into a bottle through a cork, to which it was exactly fitted. The tube went down very near to the bottom of the bottle, and therefore the rain which fell into it would soon rise above the end of the tube, so that the water was no where open to the air except for the small space of the area of the tube; and by trial it was found that there was no sensible evaporation through the tube thus fitted up.

The following table shews the result of these observations.

From July the 7th, 1766, to July the 7th, 1767, there fell in a Rain-gage, fixed

<table>
<thead>
<tr>
<th>1766.</th>
<th>1770.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bottom of the mountain.</td>
</tr>
<tr>
<td>From July 6 to 16</td>
<td>Inches.</td>
</tr>
<tr>
<td>July 16 to 29</td>
<td>3.591</td>
</tr>
<tr>
<td>July 29 to Aug. 10</td>
<td>0.558</td>
</tr>
<tr>
<td>Sept. 9, both bottles had run over.</td>
<td>3.847</td>
</tr>
<tr>
<td>Oct. 17, both bottles had run over.</td>
<td>2.365</td>
</tr>
<tr>
<td>Nov. 20, both bottles were broken by the frost.</td>
<td>1.807</td>
</tr>
</tbody>
</table>

By this table it appears, that there fell below the top of a house above a fifth part more rain than what fell in the same space above the top of the same house; and that there fell upon Westminster Abbey not much above one-half of what was found to fall in the same space below the tops of the houses. This experiment has been repeated in other cases with the same result. What may be the cause of this extraordinary difference, has not yet been discovered; but it may be useful to give notice of it, in order to prevent that error, which would frequently be committed in comparing the rain of two places without attending to this circumstance.

Such were the observations of Dr. Heberden on first announcing this circumstance, viz. of different quantities of rain falling at different heights above the ground. Two years afterward, Daines Barrington, esq. made the following experiments and observations, to shew that this effect, with respect to different places, respected only the several heights of the instruments above the ground at those places, without regard to any real difference of level in the ground at those places.

Mr. Barrington caused two other rain-gages, exactly like those of Dr. Heberden, to be placed, the one upon mount Renning, in Wales, and the other on the plane below, at about half a mile's distance, the perpendicular height of the mountain being 450 yards, or 1350 feet; each gage being at the same height above the surface of the ground at the two stations.

The results of the experiment are as below:

<table>
<thead>
<tr>
<th>1770.</th>
<th>Bottom of the mountain.</th>
<th>Top of the mountain.</th>
</tr>
</thead>
<tbody>
<tr>
<td>From July 6 to 16</td>
<td>3.591</td>
<td>3.210</td>
</tr>
<tr>
<td>July 16 to 29</td>
<td>2.185</td>
<td>1.224</td>
</tr>
<tr>
<td>July 29 to Aug. 10</td>
<td>0.610</td>
<td>0.656</td>
</tr>
<tr>
<td>Sept. 9, both bottles had run over.</td>
<td>3.234</td>
<td>2.464</td>
</tr>
<tr>
<td>Oct. 17, both bottles had run over.</td>
<td>0.747</td>
<td>0.885</td>
</tr>
<tr>
<td>Nov. 20, both bottles were broken by the frost.</td>
<td>1.281</td>
<td>1.388</td>
</tr>
</tbody>
</table>

"The inference to be drawn from these experiments, Mr. Barrington observes, seems to be, that the increase of the quantity of rain depends upon its nearer approximation to the earth, and scarcely at all upon the height of places, provided the rain-gages are fixed at about the same distance from the ground." It may not be improper to subjoin to the foregoing account, that, in places where it was first observed, a different quantity of rain would be collected, according as the rain-gages were placed above or below the tops of the neighbouring buildings; the rain-gage below the top of the house into which the greater quantity of rain had for several years been found to fall, was above fifteen feet above the level of the other rain-gage, which, in another part of London, was placed above the top of the house, and into which the lesser quantity always fell. This difference, therefore, does not, as Mr. Barrington justly remarks, depend upon the greater quantity of atmosphere through which the rain descends: though this has been supposed by some, who have hence concluded that this appearance might readily be solved by the accumulation of more drops, in a dense through a great depth of atmosphere."

In the examination of the results from meteorological tables, it should be observed, that several years' account of the rain at any place is required, before a medium yearly quantity can be obtained with sufficient accuracy. The following table, formed by Mr. Dalton, and published in the first part of the fifth volume of Manchester Memoirs, gives us the largest collection of accounts of rain fallen in different places in England that has to our knowledge hitherto appeared. They are chiefly taken from the Transactions of the Royal Society, and of other societies.

Cumberland
RAINFALL.

<table>
<thead>
<tr>
<th>Counties (Maritime)</th>
<th>Places</th>
<th>Mean annual Depth in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumberland</td>
<td>Kefwick, 7 years</td>
<td>67.5</td>
</tr>
<tr>
<td></td>
<td>Carlisle, 1 year</td>
<td>20.2</td>
</tr>
<tr>
<td>Westmoreland</td>
<td>Kendal, 11 years</td>
<td>59.8</td>
</tr>
<tr>
<td></td>
<td>Fell-foot, 3 years</td>
<td>55.7</td>
</tr>
<tr>
<td></td>
<td>Waith Sutton, 5 years</td>
<td>46.5</td>
</tr>
<tr>
<td>Lancashire</td>
<td>Lancaster, 10 years</td>
<td>45.0</td>
</tr>
<tr>
<td></td>
<td>Liverpool, 18 years</td>
<td>34.4</td>
</tr>
<tr>
<td></td>
<td>Manchefser, 9 years</td>
<td>33.0</td>
</tr>
<tr>
<td></td>
<td>Townley</td>
<td>41.0</td>
</tr>
<tr>
<td></td>
<td>Crawshawbooth, near Haf</td>
<td>60.0</td>
</tr>
<tr>
<td>Gloucestershire</td>
<td>Britoh, 3 years</td>
<td>29.2</td>
</tr>
<tr>
<td>Somersetshire</td>
<td>Bridgewater, 3 years</td>
<td>29.5</td>
</tr>
<tr>
<td>Cornwall</td>
<td>Ludguau, near Mount's</td>
<td>41.0</td>
</tr>
<tr>
<td></td>
<td>Bay, 5 years</td>
<td>29.9</td>
</tr>
<tr>
<td>Devonshire</td>
<td>Plymouth, 2 years</td>
<td>46.5</td>
</tr>
<tr>
<td>Hampshire</td>
<td>Selbourne, 9 years</td>
<td>37.2</td>
</tr>
<tr>
<td></td>
<td>Fyfield, 7 years</td>
<td>25.9</td>
</tr>
<tr>
<td>Kent</td>
<td>Dover, 5 years</td>
<td>37.5</td>
</tr>
<tr>
<td>Essex</td>
<td>Upminster</td>
<td>19.5</td>
</tr>
<tr>
<td>Norfolk</td>
<td>Norwich, 13 years</td>
<td>25.5</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>Barrowby, near Leeds</td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td>Gardfale, near Sedburgh</td>
<td>52.3</td>
</tr>
<tr>
<td>Northumberland</td>
<td>Widdrington, 1 year</td>
<td>21.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Counties (Island)</th>
<th>Places</th>
<th>Mean annual Depth in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middlesex</td>
<td>London, 7 years</td>
<td>23</td>
</tr>
<tr>
<td>Surrey</td>
<td>South Lambeth, 9 years</td>
<td>22.7</td>
</tr>
<tr>
<td>Hertfordshire</td>
<td>Near Ware, 5 years</td>
<td>25.0</td>
</tr>
<tr>
<td>Huntingdonshire</td>
<td>Kimbolton, 7 years</td>
<td>25.0</td>
</tr>
<tr>
<td>Derbyshire</td>
<td>Chatsworth, 15 years</td>
<td>27.8</td>
</tr>
<tr>
<td>Rutlandshire</td>
<td>Lyndon, 21 years</td>
<td>24.3</td>
</tr>
<tr>
<td>Northamptonshire</td>
<td>Near Oundle, 14 years</td>
<td>23.0</td>
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</tbody>
</table>

General mean 35.2

The general mean of 35.2 inches is, as our author apprehends, a little above the medium for England and Wales, as the greater number of places are those where much rain falls. If we take up a mean for each of the above-mentioned counties, (where more than one place in a county is given,) and then a general mean from the counties, the result is a reduced mean of 31.3. Even then it may be objected, that the greater part of the counties are maritime; but it must be observed, that there is no account of rain in Wales; and we may safely conclude, that the rain in Wales would exceed the last-mentioned mean as much as the inland counties of England, not in the above list, would fall short; because Wales is both a mountainous country, and exposed to the sea.

We will, therefore, conclude, that the mean annual depth of rain in England and Wales, deduced from these twenty counties, is 31 inches; a quantity which suffices for observations, our author is confident, will diminish, and probably not increase much.

The editors of the Encyclopedia, under the article Weather, from 16 places of observation, make the annual mean for Great Britain 32.53 inches; and M. Cotte, in the Journal de Physique for 1791, gives a mean derived from 147 places, in different parts of the world, equal to 34.7 inches.

If we take the dew (see Dew) at 5 inches annually, we shall have 56 inches of water at a medium annually, on the surface of the earth, in England and Wales, reckoning 31 for rain and 5 for dew. Admitting the computation of Guthrie, the area of England and Wales is 46,450,000 square miles. This, reduced to square feet, gives 1,378,520,869,000; which, multiplied by 3 feet, the annual depth of rain and dew, gives 4,135,720,859,000 cubic feet of water, = 153,176,320,000 cubic yards, or 12 cubic miles = 115,000 millions of tons in weight, nearly. This immense mass of water is disposed of partly by the supply of rivulets, and the foaming into the earth a small way, so as to break out again in lower ground in the form of springs, and then make its way to some rivers, by which it is conveyed to the sea; and partly being carried into the atmosphere in the process of evaporation. The decomposition of water by vegetables is not noticed, because it is precluded, that in the course of nature the principles are combined, and water formed again. See River, Spring, Evaporation, and Vapour.

As to the use of rain, we may observe that it moistens and softens the earth, and thus fits it for affording nourishment to plants; by falling on high mountains, it carries down, with many particles of loose earth, which serve to fertilize the surrounding vallies, and purifies the air from noxious exhalations, which tend in their return to the earth to meliorate the soil; it moderates the heat of the air; and is one means of supplying fountains and rivers. However, vehement rains in many countries are found to be attended with barrenness and poornefs of the lands, and miscarriage of the crops in the succeeding year; and the reason is plain; for these excessive storms wash away the fine mould into the rivers, which carry it into the sea, and it is a long time before the land recovers itself again. The remedy to the famine, which some countries are subject to from this fort of mischief, is the planting large orchards and groves of such trees as bear effulent fruit; for it is an old observation, that in years, when grain succeeds worth, these trees produce mott fruit of all. It may partly be owing to the thorough moistening of the earth, as deep as their roots go, by these rains, and partly to their trunks flopping part of the light mould carried down by the rains, and by this means furnishing themselves with a coat of new earth. Phil. Trans. N° 90.

The water afforded by rain is found highly refreshing to almost all sorts of vegetable crops, and to promote their growth in a rapid manner, when not produced in too great abundance at a time. This effect, which may often be perceived to take place in a sudden manner, after warm showers in the early spring months, is probably caused by the large proportion of oxygen that is contained in rain-water, as well as from the necessary moisture being afforded to the fibres of the roots of the plants. Too much rain may be injurious, however, by lessening the necessary cohesion and compactness of the soil, by which they may not afford proper support to the roots of growing vegetables. And another injury may be produced by the too frequent occurrence of heavy showers, by which a large proportion of the decomposing vegetable and animal materials of lands, which are soluble or diffusible in water, may be conveyed away into the ditches, rivers, and ultimately into the sea, and of course prove the cause of infertility. In hilly situations, this effect may arise from even light showers; on which account, they have been advised to be plunged in a planting direction, as by that means the rains may be more perfectly detained in the soil. And it has been suggested by Dr. Darwin, that as the foliage or buds of plants require more moisture for their vigorous growth than their flowers, in this climate, continued rains may be liable not only to wash off the farina from
from the burbling anthers, and in that way prevent the impregnation of the pistillate, but also delay the ripening of the seeds or fruit, from the want of a due evaporation of their perspirable matter, as well as from the last solar light in cloudy seasons. On this account it is, he supposes, that in the north of Scotland the oats are sowed seldom to ripen till the frosts commences, with the dry season which accompanies it.

Thus, as the effects of rain are so very considerable on vegetation, it would be highly useful to ascertain the quantity or depth of rain that falls annually in different districts, and the difference in the effects which are produced by it. See Water and Weather.

The vast quantities of rain which fall in some districts, from the peculiar nature of their situations, especially where they are of the grazing or pasture kind, as those of Cheshire, Lancashire, and others, are often highly beneficial to their general fertility; the natural grass pastures of which districts, though frequently of inferior qualities to those in many other places, are, in consequence of this circumstance, rendered superior in their abundance of grass, the strength of its vegetation, and the richness of its quality. The former of the above counties may indeed, without any impropriety, be reckoned one of the most productive grassland districts in the kingdom, as is fully evinced by the great abundance and superiority of its dairy products. The grass lands in this tract of country mostly retain their full verdure during the most sultry and parching seasons, except where they are of a sandy or gravelly nature in their under strata. Where they are near to the sea, however, in this as well as other parts, they are liable to become mossy, or be covered with the mors plant, either in consequence of so much of the spray from it falling in the manner of light rain, or some other cause of that kind.

The quantity of rain falling upon land has much influence upon its temperature, or state of heat, and, of course, great effect on vegetation in that way; and the nature of its mixture with it, or the manner in which it is distributed through its parts, or combined with its different carthy materials, is another means by which it becomes of great importance, as it relates to the supply of nourishment and support to vegetables as crops.

Rain falling in large quantities, on particular sorts of retentive soils, is a frequent cause of that kind of injurious wetness, which lands so much in need of surface-draining to remove it. See Surface-draining.

The nature and effects of flowers and rain are extremely curious and interesting in several different points of view, both to the agriculturist and the philosophical inquirer.

Rains, Preternatural. We have numerous accounts in historians of preternatural rains, such as the raining of stones, of dust, of blood, of mud, and of live animals, as young frogs, and the like. We are not to doubt the truth of what those who are authors of veracity and credit relate to us of this kind, so far as to suppose that the falling of stones (which see) and dust never happened; the whole mistake (if it be so with regard to the first instance) is the supposing them to have fallen from the clouds; but as to the blood and frogs, it is very certain that they never fall at all, but the opinion has been a mere deception of the senses. Men are extremely fond of the marvellous in their relations; but the judicious reader is to examine strictly whatever is reported of this kind, and is not to suffer himself to be deceived.

There are two natural methods by which quantities of stones and dust may fall in certain places, without their having been generated in the clouds, or fallen as rain. The one is by means of hurricanes: the wind which we frequently see tearing off the tiles of houses, and carrying them to considerable distances, being equally able to take up a quantity of stones, and drop them again at some other place. But the other, which is much the most powerful, and probably the most usual way, is for the eruptions of volcanoes, and burning mountains, to toss up, as they frequently do, a vast quantity of stones, ashes, and cinders, to an immense height in the air; and these being hurled away by the hurricanes and impetuous winds, which usually accompany those eruptions, and being in themselves much lighter than common stones, as being half calcined, may easily be thus carried to vast distances, and their falling in places where the inhabitants know nothing of the occasion, they cannot but be supposed by the vulgar to fall on them from the clouds. It is well known, that in the great eruptions of Etna and Vesuvius, showers of ashes, dust, and small cinders, have been seen to obscure the air, and spread the surface of the sea for a great way, and cover the decks of ships; and this at such a distance, as it should appear (conceivable) that they should have been carried to; and probably, if the accounts of all those showers of these substan ces mentioned by authors be collected, they will all be found to have fallen within such distances of volcanoes; and if compared, as to the time of their falling, will be found to correspond in that also with the eruptions of those mountains. We have known instances of the ashes from Vesuvius having been carried thirty, nay forty leagues, and peculiar accidents may have carried them yet farther.

The raining of blood has been ever accounted a more terrible sight, and a more fatal omen, than the other preternatural rains already mentioned. It is very certain that nature forms blood no where but in the vessels of animals, and therefore showers of it from the clouds is by no means to be credited. Those who suppose that what has been taken for blood, has been actually seen falling through the air, have had recourse to flying insects for its origin, and suppose it the eggs or dung of certain butterflies discharged from them as they were high up in the air. But this seems a very wild conjecture, as we know of no butterfly whose excrements, or eggs, are of such a colour, or whole abode, as is so high, or their flocks so numerous, as to be the occasion of this.

It is most probable that these bloody waters were never seen falling, but the people seeing the standing waters blood-coloured, were alarmed, from their not knowing how it should else happen, that it had rained blood into them. A very memorable instance of this there was at the Hague in the year 1679. Swammerdam, who relates it, tells us, that one morning the whole town was in an uproar, on finding their lakes and ditches full of blood, as they thought, and having been certainly full of water the night before, they agreed it must have rained blood in the night; but a certain physician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microscope, and found that the water was water still, and had not at all changed its colour, but that it was full of prodigious swarms of small red animals, all alive, and very nimble in their motions, whose colour and prodigious number gave a red tinge to the whole body of the water they lived in, on a lens accurate inspection. The certainty that this was the case, did not however persuade the Hollanders to part with the miracle; they prudently concluded, that the sudden appearance of such a number of animals was as great a prodigy as the raining of blood would have been; and are assured at this day, that this portent foretold the scene of war and devastation which Lewis XIV. afterwards brought into that country, which had before enjoyed forty years uninterrupted peace.
The animals, which thus colour the water of lakes and ponds, are the pulces arborescentes of Smawderam, or the water-fleas with branched horns. These creatures are of a reddish-yellow, or flame colour; they live about the sides of ditches, near weeds, and among the mud, and are therefore less visible, except at a certain time, which is in the end of May or beginning of June: it is at this time that these little animals leave their reccefs to float loose about the water, to meet for the propagation of their species, and by that means become visible in the colour they give the water. This is visible, more or less, in one part or other of almost all standing waters at this season; and it is always at this season that the bloody waters have alarmed the ignorant.

The raining of frogs is a thing not less wonderful in the accounts of authors who love the marvellous, than those of blood, or of stones; and this is supposed to happen so often, that there are multitudes who pretend to have seen eye-witnesses of it. These rains of frogs always happen after very dry seasons, and are much more frequent in the hotter countries than the cold ones. In Italy they are very frequent; and it is not uncommon to see the streets of Rome swarming both with young frogs and toads in an instant, in a flower of rain; they hopping every where between the people’s legs, as they walk, though there was not the least appearance of them before. Now they have been seen to fall through the air down upon the pavements. This seems a strong circumstance in favour of their being rain’d down from the clouds, but when strictly examined, it comes to nothing; for these frogs, that are seen to fall, are always found dead, lamed, or bruised by the fall, and never hop about as the rest; and they are never seen to fall, except close under the walls of houses, from the roofs and gutters of which they have accidentally slipped down.

To the raining of frogs we ought to add the raining of grass-hoppers and locusts, which have sometimes appeared in prodigious numbers, and devoured the fruits of the earth. There has not been the least pretence for supposing that these animals descended from the clouds, but that they appeared on a sudden in prodigious numbers. The naturalist, who knows the many accidents attending the eggs of these, and other like animals, cannot but know that some genera will prove particularly favourable to the hatching of them, and the prodigious number of eggs that many insects lay, could not but every year bring us such abundance of the young, were they not liable to many accidents, and had not provident nature taken care, as in many plants, to continue the species by a very numerous flock of seeds, of which perhaps not one in five hundred need take root, in order to continue an equal number of plants.

The raining of fishes has been a prodigy also much talked of in France, where the streets of a town at some distance from Paris, after a terrible hurricane in the night, which tore up trees, blew down houses, &c. were found in a manner covered with fishes of various sizes. Nobody here made any doubt of these having fallen from the clouds; nor did the absurdity of fish, of five or six inches long, being generated in the air, at all stirle the people; or make their belief in the miracle, till they found upon inquiry that a very well-flocked fish-pond, which flood on an eminence in the neighbourhood, had been blown dry by the hurricane, and only the great fish left at the bottom of it, all the smaller fry having been tolled into their streets.

Upon the whole, all the supposed marvellous rains have been owing to substances naturally produced on the earth, and either never having been in the air at all, or only carried thither by accident.

Vol. XXIX.

RAIN. Freezing. See Freezing.
RAINF, Bird, in Ornithology. See Cuculus Pluvialis.
RAIN-FOWL, an English name given by many to the common green woodpecker, or picus viridis, from an observation that it is always seen clamorous when rainy weather is coming on. The Latins have, for the same reason, called it the pluvialis avis. See Picus.
RAIN-GAGE, called also Ombrometer and Pitometer, an instrument for measuring the quantity of rain that falls. That which is mentioned under the article Ombrometer, consists of a tin funnel d (Plate XXIV. Miscellany, fig. 2.), whose surface is an inch square, a flat board a, and a glass tube b, let into the middle of it in a groove, and an index with divisions e, f; the board and tube being of any length at pleasure. The bore of the tube is about half an inch, which, says Mr. Pickering, the inventor, is the best size. This machine is fixed in some free and open place, as the top of the house, &c.

The rain-gage employed in the house of the Royal Society, is described by Mr. Cavendish in the Phil. Trans. for 1776, p. 384. The vessel which receives the rain is a conical funnel, strengthened at the top by a brass ring, twelve inches in diameter. The sides of the funnel, and inner lip of the brass ring, are inclined to the horizon, at an angle of above 65°, and the outer lip at an angle of above 55°, which is such a degree of steepness, that there seems to be no probability either that any rain which falls within the funnel, or on the inner lip of the ring, should dash out, or that any which falls on the outer lip should dash into the funnel. A vertical section of the funnel appears in Plate XXIV. Miscellany, fig. 3; A B C and a b c being the brass ring, B A and b a the inner lip, and B C and b c the outer. This vessel is placed on some flat leads, on the top of the society’s house. It can hardly be screened from any rain by the chimneys, as none of them are elevated above it in an angle of more than 25°, and as it is raised ¾ feet above the roof, there seems no danger of any rain dashing into it by rebounding from the lead.

In fixing rain-gages care should be taken that the rain may have free access to them, without being impeded or obstructed by buildings, &c. and therefore the tops of houses are to be preferred. Also, when the quantities of rain collected in them, at different places, are compared together, the instruments ought to be fixed at the same height above the ground at both places; because at different heights the quantities are always different, even in the same place. And hence also, any register or account of rain in the gage ought to be accompanied with a note of the height at which the instrument is placed above the ground. Dalton found the rain of a gage 50 yards high, in summer two-thirds, and in winter one-half as much as that of a gage below. Mr. Dalton observes, that a strong funnel, made of sheet iron, tinned and painted, with a perpendicular rim, two or three inches high, fixed horizontally in a convenient frame, with a bottle under it to receive the rain, is sufficient for this purpose.

The rain-gage is an invention which should be in the possession of every correct farmer in every part of the kingdom, and which would thereby have much tendency to the improvement of agriculture as contributing to the knowledge of the degree of moisture which prevails in the soils, after showers or heavy rains, with greater accuracy and certainty than has been hitherto the case.

It is noticed by Mr. Nairn, in his Agricultural Survey of Clydesdale, that professor Anderson, of the university of Glasgow, has invented, perhaps, the most ingenious and accurate rain-gage of any that has yet been known. It receives
the rain at a little more than one hundred feet above the level of the sea; accounts which have been regularly kept since the year 1781; but previously to that period the rain was measured by an old rain-gage. It is to be regretted, however, that the exact nature of this invention is not more fully explained; and that other cheap plain inventions of this nature are not better known to the farmer.

**RAIN.** See Water.

**Rains,** in the Sea Language, denote all that tract of sea to the northward of the equator, between four and ten degrees of latitude; and lying between the meridian of Cape Verde and that of the eastermost islands of the Lame

Rain it takes its name from the almost continual calms, constant rains, and thunder and lightning, to a great degree, always found there. The winds, when they do blow, are only small uncertain gusts, and shift about all round the compass; so that ships are sometimes detained here a long while, and can make but very little way.

**RAINBOW.** Iris, or, simply, the bow, a meteor in form of a parti-coloured arch, or semicircle, exhibited in a rainy sky, opposite to the fun, by the refraction of his rays in the drops of falling rain.

There is an in secondary, or fainter bow, usually seen inclining the former at some distance. Among naturalists, we also read of lunar rainbows, marine rainbows, &c.

The rainbow, sir Isaac Newton observes, never appears but where it rains in the fun-shine; and it may be represented artificially by contriving water to fall in little drops, like rain, through which the fun shining, exhibits a bow to a spectator placed between the fun and the drops; especially if a dark body, e. g. a black cloth, be disposed beyond the drops.

That the rainbow is opposite to the fun, has always been observed. It was, therefore, natural to imagine, that the colours of it were produced by some kind of reflection of the rays of light from drops of rain or vapour. The regular order of the clouds was another circumstance that could not have escaped the notice of any person. But though more reflection had in no other case been observed to produce colours, and it could not but have been observed that reflection is frequently attended with that phenomenon, so that some of the ancients, as we learn from Aristotle's tract on meteors, knew that the rainbow was caused by the refraction of the sun's light in drops of falling rain; yet no person seems to have thought of having recourse to a proper refraction in this case before one Fletcher of Breflau, who, in a treatise which he published in 1571, endeavoured to account for the colours of the rainbow by means of a double refraction, and one reflection. But he imagined that a ray of light, after entering a drop of rain, and suffering a refraction, both at its entrance and exit, was afterwards reflected from another drop, before it reached the eye of the spectator. He seems to have overlooked the refraction at the farther side of the drop, or to have imagined that all the bendings of the light within the drop would not make a sufficient curvature, to bring the ray of the fun to the eye of the spectator. Antonio de Dominis, bishop of Spalato, whose treatise, "De Radiis Volus et Lucis," was published by I. Bartolius, in 1611, was the first person who advanced, that the double refraction of Fletcher, with an intervening refraction, was sufficient to produce the colours of the rainbow, and also to bring the rays that formed them to the eye of the spectator, without any subsequent refraction. He distinctly describes the progress of a ray of light entering the upper part of the drop, where it suffers one refraction, and after being thereby thrown upon the back part of the inner surface, is from thence reflected to the lower part of the drop; at which place undergoing a second refraction, it is thereby bent so as to come directly to the eye. To verify this hypothesis, he procured a small globe of fluid glass, and viewing it when it was exposed to the rays of the fun, in the same manner in which he had supposed that the drops of rain were situated with respect to them, he actually observed the same colours which he had seen in the true rainbow, and in the same order. The theory of A. de Dominis was adopted, and in some degree improved, by Descartes. Philosophers were, however, for a long time at a loss when they endeavoured to assign reasons for all the particular colours, and for the order of them. Indeed, nothing but the doctrine of the different refrangibility of the rays of light, which was a discovery reserved for the great Sir Isaac Newton, could furnish a complete solution of this difficulty.

Dr. Barrow, in his "Lecciones Opticas," (Lect. 12. n. 14.) says, that a friend of his, meaning Mr. Newton, communicated to him a method of determining the angle of the rainbow, which was hinted to Newton by Slusius, without making a table of the refractions, as Descartes did. The doctor shows the method, with other curious particulars. But the subject was given more perfectly by Newton afterwards, in his "Optics," prop. 9; where he makes the breadth of the interior bow to be nearly 22° 15', that of the exterior 34° 40', their distance 8° 25', the greatest semidiameter of the interior bow 42° 17', and the least of the exterior 50° 42', when their colours appear strong and perfect.

**Rainbow, Theory of the.** To conceive the origin of the rainbow, let us consider what will befall rays of light coming from a very remote body, e. g. the sun, and falling on a globe of water, such as we know a drop of rain to be.

Suppose, then, A D K N (Plate XVIII. Optics. fig. 1.) to be a drop of rain, and the lines E F, B A, O N, to be rays of light coming from the centre of the fun; which, on account of the immense dilution of the fun, we conceive to be parallel.

Now the ray B A being the only one that falls perpendicularly on the surface of the water, and all the rest obliquely, it is easily inferred, that all the other rays will be refracted towards the perpendicular. (See Refraction.)

Thus the ray E F, and others accompanying it, will not go on straight to G; but as they arrive at H I, they will deflect from F to K; where some of them, probably, escaping into the air, the rest are reflected upon the line K N, so as to make the angles of incidence and refraction equal.

Farther, as the ray K N, and those accompanying it, fall obliquely upon the surface of the globe, they cannot pass out into the air, without being refracted, so as to recede from the perpendicular L M; and, therefore, they will not proceed straight to Y, but will deflect to P.

It may be here observed, that some of the rays, arriving at N, do not pass out into the air, but are again reflected to Q; where being refracted, like the rest, they do not proceed right to Z; but, declining from the perpendicular T V, are carried to R; but since we here only regard the rays as they may affect the eye placed a little below the drop, e. g. at P, those which deflect from N to Q, we let aside, as useless, because they never come to the eye. On the contrary, it is to be observed, that there are other rays,
rays, as \(2 \frac{3}{4}\), and the like; which, being refracted from 3 to 4, and reflected to 5, and from 5 to 6, may at length, by refraction at 6, arrive at the eye \(\gamma\), placed beneath the drop.

Thus much is obvious; but to determine precisely the quantities of refraction of each ray, there must be a calculation; by such calculation it appears, that the rays which fall on the quadrant A D, are continued in lines, like those here drawn in the drop A D K N; whereas there are three things very considerable: first, that the two refractions of the rays, in their ingress and egress, are both the same way; so that the latter does not destroy the effect of the former. Secondly, that all of the rays passing out of A N, N P, and those adjoining to it, are the only ones capable of affecting the eye, as being sufficiently close and contiguous, and because they come out parallel; whereas the rest are diverging, and dispersed too far to have any sensible effect, at least to produce any thing so vivid as the colours of the bow. Thirdly, that the ray N P has shade or darkness under it; for, since there is no ray comes out of the surface N 4, it is the same thing as if the part were covered with an opaque body. We might add that the same ray N P has darkness above it; since the rays that are above it are inefficient, and signify no more than if there were none at all.

Add to this, that all the effectual rays have the same point of reflection, i.e. the parallel and contiguous rays, which alone are effectual after refraction, will all meet in the same point of the circumference, and be reflected thence to the eyes.

Farther, it appears, that the angle O N P, included between the ray N P, and the line O N drawn from the centre of the bow, is the angle by which the rainbow is distant from the opposite point of the sun, and which makes the semi-diameter of the bow. The method of determining it will be seen in the sequel of the article. But since, besides those rays coming from the centre of the sun to the drop of water, there are many more from the several points of its surface; there are a great many other effectual rays to be considered, especially that from the uppermost, and that from the lowest part of the sun's body.

Since, then, the apparent semi-diameter of the sun is about 16 minutes, it follows, that an effectual ray from the upper part of the sun will fall higher than the ray E F by 16 minutes; thus does the ray G H (fig. 2.) which, being refracted as much as E F, deferts to I, thence to L, and at length emerging equally refracted with the ray N P, proceeds to M; and makes an angle O N M with the line O N. In the like manner, the effectual ray Q R coming from the lowest part of the sun, falls on the point R, 16 minutes lower than the point F on which the ray E F falls; and this, being refracted, declines to S; whence it is reflected to T; where, emerging into the air, it proceeds to V; so that the line T V, and the ray O T, contain an angle whose magnitude will be ascertained. Again, upon computing the deflections of the rays, which like that 2 (fig. 1.) coming from the centre of the sun, and being received into the lower part of the drop, we have supposed to be twice reflected, and twice refracted, and to enter the eye by lines like that 67 (fig. 3.) we find that which may be accounted effectual, as 67 with the line 86 drawn from the centre of the sun, contains an angle 867; whence it follows, that the effectual ray from the highest part of the sun to the eye in F, the angle 86 F becomes of a certain magnitude ascertained below. In like manner, since G H I K L M is the way of an effectual ray from the lowest part of the sun to the eye, the angle 86 M becomes greater than the former by 16 minutes.

Since, then, we admit several rays to be effectual, besides those from the centre of the sun, what we have said of the shade will need some alteration; for of the three rays described (figs. 2 and 3.), only the two extreme ones will have a shadow joined to them, and that only on the outer side. Hence it is evident, that these rays are perfectly dispersed to exhibit all the colours of the prism.

For the great quantity of dense or intense light, i.e. the bundle of rays collected together in a certain point, e.g. in the point of reflection of the effectual rays, may be accounted as a lucid or radiant body, terminated all around by shade. But the several rays, thus emitted to the eye, are both of different colours; that is, they are fitted to excite in us the ideas of different colours; and are differently refracted out of the water into the air, notwithstanding their falling alike upon the refracting surface.

Hence it follows, that the different or heterogeneous rays will be separated from one another, and will tend separate ways; and the homogeneous rays will be collected, and tend the same way; and, therefore, this lucid point of the drop in which the refraction is effectual, will appear fringed or bordered with several colours; that is, red, green, and blue colours will arife from the extremes of the red, green, and blue rays of the sun, transmitted to the eye from several drops, one higher than another, after the fame manner as is done in viewing lucid or other bodies through a prism.

Thus, adds Sir Isaac Newton, the rays that differ in refrangibility, will emerge at different angles; and, consequently, according to their different degrees of refrangibility, emerging most copiously at different angles, they will exhibit different colours in different places.

A great number, then, of these little globules being difpand in the air, will fill the whole space with these different colours; provided they be so dispersed as that effectual rays may come from them to the eye; and thus will the rainbow, at length, arife.

Now, to determine what that disposition must be, suppose a right line drawn from the centre of the sun through the eye of the spectator, as the line V X (fig. 2.) called the line of sight, or axis of vision; being drawn from to remote a point, it may be eliemed parallel to all other lines drawn from the same point; but a right line, falling on two parallels, makes the alternate angles equal.

If, then, an indefinite number of lines be imagined drawn from the spectator's eye to a part opposite to the sun where it rains; which lines make different angles with the line of sight, equal to the angles of refraction of the differently refrangible rays, these lines, as rays, on drops of rain illumined by the sun, will make angles of the same magnitude with rays drawn from the centre of the sun to the same drops. And, therefore, the lines thus drawn from the eye will represent the effectual rays that occasion the sensation of any colour.

Now it is known, that the eye, being placed in the vertex of a cone, sees objects upon its surface, as if they were in a circle; and the eye of our spectator is here in the common vertex of several cones, formed by the several kinds of effectual rays, with the line of sight. Now in the surface of that whole angle at the vertex, or eye, is the greatest, and in which the others are included, are those drops, or parts of
of drops, which appear red; and in the surface of that cone whose angle is least, are the purple drops; and in the intermediate cones, are the green, blue, &c. drops. Hence, then, several kinds of the drops must appear as if disposed into so many circular coloured facets, or arches, as we see in the rainbow. (Rohault's Sytem of Nat. Phil. vol. ii. part iii. cap. 17.) This part of the solution for Isaac Newton expresses more precisely, thus: suppose O (fig. 4.) the eye, and OP a line parallel to the sun's rays; and let POE, POF, be angles of 40° 17', and 42° 2'. And suppose the angles to turn about their common side OP, with their other sides OE and OF, they will describe the bounds, or verges, of the rainbow.

For if E, F be drops placed anywhere in the conical surface described by OE, OF, and be illuminated by the sun's rays SE, SF; the angle SEO being equal to the angle POE, or 40° 17', shall be the greatest angle in which the most refrangible rays can, after reflection, be refracted to the eye; and, therefore, all the drops in the line OE shall send the most refrangible rays most copiously to the eye, and therefore strike the facets with the deepest violet colour in that region.

And in like manner the angle SFO being = to the angle POF = 42° 2', shall be the greatest in which the least refrangible rays after one reflection can emerge out of the drops; and these rays shall come most copiously to the eye from the drops in the line OF, and strike the facets with the deepest red colour in that region.

And, by the same argument, the rays which have intermediate degrees of refrangibility, shall come most copiously from drops between E and F, and so strike the facets with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progress from E to F, or from the inside of the bow to the outside, in this order: violet, indigo, blue, green, yellow, orange, red; though the violet, by the mixture of the white light of the clouds, will appear faint, and incline to a purple.

Here it may be observed, that all the rays but the violet in the line SE will emerge from E in a greater angle than SEO made by the violet, and consequently will pass below the eye; and all the rays but the red in the line SF will emerge from F in a less angle than SFO made by the red, and consequently will pass above the eye; by which means only red will appear in the line SF, and only violet in the line SE.

And, since the lines OE, OF, may be situated any where in the above-mentioned conical surface; what is said of the drops and colours of the same lines, is to be understood of the drops and colours throughout the whole superficies. Thus is the primary or inner bow formed.

RAINBOW, Secondary, or Outer. As to the secondary, or fainter bow, usually surrounding the former, in affording what drops would appear coloured, we excluded such as lines drawn from the eye, making angles a little greater than 42° 2', shall fall upon, but not such as should contain angles much greater.

For, if an indefinite number of such lines be drawn from the spectator's eye, some of which make angles of 50° 57', with the line of ascent, e. gr. OG; other angles, of 54° 7', e. gr. OH; these drops on which these lines fall must of necessity exhibit colours; particularly those of 50° 57'.

E. gr. The drop G will appear red; the line GO being the fame with an effeetual ray; which, after two reflections, and two refractions, exhibits a red colour. Again, those drops which receive lines of 54° 7', e. gr. the drop H, will appear purple; the line OH being the fame with an effeetual ray; which, after two reflections and two refractions, exhibits purple.

Now there being a sufficient number of these drops, it is evident there must be a second rainbow, formed after the like manner as the first.

Thus, according to sir Isaac Newton, in the least refrangible rays, the least angle at which a drop can send effeetual rays after two reflections, is found by computation to be 50° 57'; and in the most refrangible, the least angle is found 54° 7'.

Suppose, then, O the place of the eye, as before, and POG, POH, to be angles of 50° 57', and 54° 7'; and these angles to be turned about their common side OP; with their other sides OG, OH, they will describe the verges, or borders, of the rainbow C H D G.

For, if G, H be drops placed anywhere in the conical superficies described by OG, OH, and be illuminated by the sun's rays, the angle SG O, being equal to the angle POG, or 50° 57', shall be the least angle in which the least refrangible rays can, after two reflections, emerge out of the drops; and, therefore, the least refrangible rays shall come most copiously to the eye from the drops in the line OG, and strike the facets with the deepest red in that region.

And the angle SHO being equal to P OH, 54° 7', shall be the least angle in which the most refrangible rays, after two reflections, can emerge out of the drops; and, therefore, those rays shall come most copiously to the eye from the drops in the line OH, and so strike the facets with the deepest violet in that region.

And, by the same argument, the drops in the region, between G and H, shall strike the facets with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progress from G to H, or from the inside of the bow to the outer, in this order: red, orange, yellow, green, blue, indigo, violet.

And since the lines OG, OH, may be situated anywhere in the conical superficies; what is said of the drops and colours in these lines is to be understood of the drops and colours every where in this superficies.

Thus are formed two rainbows, an interior and stronger, by one reflection; and an exterior and fainter, by two; the light becoming weaker and weaker by every reflection.

Their colours will lie in a contrary order to one another; the first having the red without, and the purple within; and the second, the purple without, and red within; and so of the rest.

RAINBOW, Artificial. This doctrine of the rainbow is confirmed by an easy experiment: for upon hanging up a glass globe, full of water, in the sun-shine, and viewing it in such a posture as that which the rays, which come from the globe to the eye, may, with the sun's rays, include an angle either of 42°, or 50°; if, e. gr. the angle be about 42°, the spectator, supposing at O, will see a full red colour in that side of the globe opposite to the sun, as at F. And if that angle be made a little less, supposing by depressing the globe to E, the other colours, yellow, green, and blue, will appear successively, in the same side of the globe, also exceedingly bright.

But if the angle be made about 50°, supposing by raising the globe to G, there will appear a red colour in that side of the globe towards the sun, though somewhat faint; and if the angle be made greater, supposing by raising the globe to H, this red will change successively to the other colours, yellow, green, and blue.

The same thing is observed in letting the globe revolve, and raising or depressing the eye so as to make the angle of a jilt magnitude.
RAINFALL.

Newton's Optics, part ii. prop. 9. prob. 4. p. 147. ed. 3.

RAINFALL. Dimension of the.—Descartes first determined its diameter by a tentative and indirect method; laying it down, that the magnitude of the bow depends on the degree of refraction of the fluid; and assuming the ratio of the sine of incidence to that of refraction to be in water as 250 to 187.

But Dr. Halley has, in the Philosophical Transactions, N° 267, given us a simple direct method of determining the diameter of the rainbow from the ratio of refraction of the fluid being given; or, vice versa, the diameter of the rainbow being given, to determine the refractive power of the fluid.

The principles of Dr. Halley's construction for this purpose, illustrated and facilitated by Dr. Morgan, bishop of Ely, will be understood from the following view of them.

Let SN, Sn, (Plate XVIII. Optics, fig. 5.) be two of the efficacious rays incident upon a drop of rain; these, when refracted to the same point F, and thence reflected to G, g, will have the parts within the drop on one side NF, nF, equal to those on the other side FG, Fg, from the nature of the circle, and because the angles of incidence CFN, CFN, are equal to the angles of reflection CFG, Cfg. And since the parts within the drop are equal and alike situated, they will be similarly situated with regard to the drop itself; and, consequently, as the incident rays SN, Sn, are supposed to be parallel, the emergent rays GR, gr, will be also parallel. From C, the centre, draw the radii CN, Cn, CF, then will CNF = CFN be the angle of refraction, and the small arc Nn is the nafcent increment of the angle of incidence BCN; and as it measures the angle at the centre Cn, it is double the angle at the circumference upon the same arc, viz. NFn, which is the nafcent increment of the angle of refraction NFC.

Further, let the ray SN (fig. 6.) enter the lower part of the drop, and be twice reflected within the drop at F and G; then is the ray NF equal to the ray FG, and the arc NF = the arc FG. Draw Fg parallel to FG, and it will be the reflected part of some ray Sn, whose obliquity to the drop makes it cross the ray NF in its refraction; then will the part nf = Fg, and the arc nf = Fg, and the small arc Ff = Gg. Therefore, 2Ff = (Ff + Gg = the arc FG - Fg = NF - nf =) Nn - Ff; consequently Nn = 3Ff, i.e. the nafcent increment of the angle of incidence is equal to three times that of the angle of refraction. After a like manner it may be shown, that after three, four, four, &c. reflections, the increment of the angle of incidence will be four, five, six, &c. times greater than that of the angle of refraction. Hence, in order to find the angle of incidence of an efficacious ray, after any given number of reflections, we are to find an angle whose nafcent increment has the same ratio to the increment of its corresponding angle of refraction, generated in the same time, as the given number of reflections (n) increased by unity has to unity; i.e. as n + 1 to 1. But these increments are as the tangents of the respective angles directly.

For let ACD, ABD (fig. 7.) be the angles of incidence and refraction proposed; and if we suppose the line AC to move about the point A in the plane of those angles, the extremity of it, C, will describe the circle AC; and when AC is arrived at the situation A, the line BD will be thereby removed into the situation B. Draw CD, then is the angle ACD = A BC + C A B, and the angle A cd = C B A + e A B; therefore the excess of A cd above ACD, or the increment of ACD, is equal to both the angles C B e and C A e. But since the angle A e C differs infinitely little

from a right one, a circle described on the diameter A C shall pass through the points D and e; and, therefore, the angles C A e, C D e, (infilling on the same arc C e of the said circle) will be equal; and, therefore, the increment of the angle A CD is equal to C B e + C D e = C d e. But the nafcent angles D c e and D B e are as their sines, that is, as their opposite sides BD and D c = D e, the angle C D e being infinitely small; but BD : CD :: DE : DA (the line DE being parallel to AC) :: tangent of the angle EBD = ACD : tangent of the angle ABD. Therefore the increment D d e of the angle ACD is to the increment C B e of the angle ABD (generated in the same time) as the tangent of the former to the tangent of the latter directly. Hence the praxis is as follows:

First, The ratio of the sine of incidence, to the sine of refraction, being given; to find the angles of incidence, and refraction of a ray, which becomes efficacious after any given number (n) of reflections.—Suppose any given line, as A C (fig. 8.) which divide in D; so that A C : A D :: I : R; and again divide it in E, so that A C may be to AE as the given number of reflections, increased by unity, is to unity; i.e. as n + 1 : 1. Upon the diameter C E describe a semicircle C E B, and from the centre C, with the radius A D, describe an arc DB intersecting the semicircle in B; then drawing A B, C B, and letting fall the perpendicular A F on C B produced; A B C, or its complement to two right angles, A B F, will be the angle of incidence; and A C B the angle of refraction required. For, drawing B E parallel to A F, the triangles A C E and E C B are similar. Now, the sine of the angle A B C, or A B F, is to the sine of A C B as A C to A B = A D = I. to R; therefore if A B F be the angle of incidence, A C F will be the angle of refraction. Moreover, the nafcent increment of A B F is to that of A C B (generated in the same time) as C F : B F :: A C : A E, on account of the similar triangles; i.e. as n + 1 to 1, by construction. The ratio, therefore, of the nafcent increment of the angle of incidence A B F to that of the angle of refraction A C B, is that which is required in the angles of incidence and refraction of an efficacious ray, after a given number of reflections; consequently the angles A B F and A C F are those required. From this construction we may easily deduce Sir Isaac Newton's rule for finding the angle of incidence A B F. See his Optics, p. 148, 149.

For A C : A B :: I : R; whence A C = \( \frac{I}{R} \times A B \); and C F : B F :: n + 1 : 1; therefore C F = n + 1 \times B F; or (putting n + 1 = m) C F = m \times B F; and, on account of the right angle at F, A C² = C F² = A B² - B F², i.e. \( \frac{I}{R} \) A B - m B F = A B - B F²; and, therefore, m B F² - B F² = \( \frac{I}{R} \) A B - A B²; and, conseqently, B F = \( \sqrt{\frac{I}{I - R R}} \) A B = \( \sqrt{\frac{I}{I - R R}} \). Hence, because in the first bow, the ray emerges after one reflection, we have \( n = 1, m = 2, m' = 4 \), and \( m - 1 = 3 \); therefore \( \sqrt{3 R R} : \sqrt{I - R R} :: A B : B F \); therefore the radius of the angle of incidence. In the second bow, where there are two reflections, \( m' = 1 = 8 \); whence \( \sqrt{8 R R} : \sqrt{I - R R} :: A B : B F \). In the third bow, after three reflections, \( m'' = 1 = 15 \); and \( \sqrt{15 R R} : \sqrt{I - R R} :: A B \).
To the coine of the angle of incidence,

\[ \frac{BAF}{F} = 30^\circ 37' \]

Hence the angle of incidence A B F is 59° 23' in the red rays.

Secondly, Having given the angle of incidence, and the ratio of I to R, or of refraction; to find the angle which a ray of light emerging out of a refracting sphere, after a given number of refractions, makes with the axis of vision, or an incident ray, and consequently, to find the diameter of the rainbow.

The angle of incidence, and the ratio of refraction, being given, the angle of refraction is given; which angle being multiplied by double the number of refractions increased by 2, and double the angle of incidence subtracted from the product, the angle remaining is the angle sought.

In order to find the angle of refraction, say

\[ \text{As } \frac{I}{R} = 108, \text{ with logarithm is } - 2.033424 \]

\[ \text{Is to } R = 81 \]

\[ \text{So is the fine of incidence } 59^\circ 23' = 9.934708 \]

To the fine of the angle of refraction 40° 12' 9.809859

Then, making the angle CNF (fig. 9.) = 40° 12', NF will be the refracted ray, which at F is reflected into FG, and at G emerges in GR. Produce the incident and emergent rays SN and RG, till they intersect each other at X, and as CF bisects the angle N FG, it will, if produced, bisect the angle SX R. Then CFN = C X N + FN X; but FN X = C N X - C N F; therefore CFN = C X N + C N X - C N F; that is, 2 C F N - C N X = C X N; or 3° 24' - 59° 23' = 21° 51' = C X N; therefore 2 C X N = S X R = 42° 2'; which is the measure of the angle that the incident and emergent rays, which are the least refrangible, contain with each other. \[ \text{If instead of the ratio 108 to 81, we take that of } 109 \text{ to } 81, \text{ we shall find the values of } \sqrt{3} R \text{, and } \sqrt{1} = R, \text{ such as will give the angle of incidence B C N, and the arc } B N = 58^\circ 40', \text{ and the angle } S X R = 40^\circ 17', \text{ for the most refrangible, or extreme violet rays.} \]

If the ray be twice reflected, viz., at F and G, as in the production of the extreme bow, and emerges at H in the direction HA, intercepting the incident ray SN in Y, we may find the angle A Y S thus: produce A H till it meets G X, produced in R; then in the triangle H G R, the external angle H G X = H R G + H G R. But because of equal angles of reflection at F and G, H G R = F G X; therefore H G X = FG X = H G F + H R G = 2 C G F, or C N F. But S X R = 4 C N F - 2 C N X; therefore in the triangle Y X R we have the two internal angles \[ \text{R X } = 6 \text{ C N F} - 2 \text{ C N X} = \text{the external angle at } Y, \text{ viz. A Y N. In this case, to find the angles of incidence and refraction, we have } \sqrt{8} R = ; \sqrt{1} = R; \text{ radius; } \text{coine of the angle of incidence; whence the said angle will be found } 71^\circ 50' = \text{C N X. And as 108; } 81 = \text{fine of } 71^\circ 50'; \text{ fine of } 45^\circ 27' = \text{C N F, the angle of refraction; therefore } 6 \times 45^\circ 27' - 2 \times 71^\circ 50 = 120^\circ 3' = \text{AYN; and, therefore, its complement } A Y S = 50^\circ 57', \text{ the angle required for the least refrangible rays. But for the most refrangible, where } I: R = 109:81, \text{ we have the angle of incidence } 71^\circ 26', \text{ and the angle of refraction } 44^\circ 47'; \text{ and, therefore, the angle } A Y S = 54^\circ 7'. \text{ In the same manner the same angles are calculated after three or four refractions.} \]

From the preceding problems we obtain the following results, viz.,

I. Rainbow, \{ Red 42° 2' \} The spectator's back being turned

II. Rainbow, \{ Red 50° 57' \} to the fun.

If the angle made by a ray, after three or four refractions, were required, and therefore the diameters of the third and fourth rainbow (which are scarcely ever seen, on account of the great dimunition of the rays, by so many repeated refractions) they will be found, III. Rainbow, \{ Red 41° 37' \} The spectator being turned to wards the fun.

IV. Rainbow, \{ Red 43° 52' \} The spectator being turned to wards the fun.

Dr. Morgan's Dissertation upon the Rainbow, among the notes upon Rohault's Systém of Philosophy, part iii. chap. xvii.

Hence, the breadth of the rainbows is easily found: for the greatest semi-diameter of the first crown, i.e. from red to red, being 42° 2'; and the least, viz. from violet to violet, 40° 17'; the breadth of the fæcia or bow, measured across from red to violet, will be 1° 43'; and the greatest diameter of the second bow being 54° 2', and the least 50° 57', the breadth of the fæcia will be 32° 10'. And hence the difference between the two will be found 8° 54'.

In thefe measures the fun is only esteemed a point; wherefore, as his diameter is really about 30', or 32', so much must be added to the breadth of each fæcia or bow, from red to violet, and so much must be subtracted from the difference between them.

This will leave the breadth of the primary bow, 2° 15'; that of the secondary bow, 5° 30'; and the interval between the bows, 8° 25'; which dimensions, deduced by calculation, Ibn Isaac Newton affirms us from his own observations, agree very exactly with those found by actual measurement in the heavens. Optics, p. 153. ed. 3.

Rainbow, Particular Phemomena of the. From this theory of the rainbow, all the particular phenomena of it are easily deduced: hence we see why the iris is always of the same breadth; because the intermediate degrees of refrangibility of the rays between red and violet, which are its extreme colours, are always the same. See Apparent Magnitude.

Secondly, Why it is more diffinitely terminated on the side of the red than on that of the violet? there being no efficacious rays in the space adjoining to the red drops, i.e. to the space between the bows, whence it terminates abruptly; whereas, in the space on the side of the violet ones, there are some rays emitted to the eye, which, though too feeble to affect it strongly, yet have this effect, that they soften the violet edge insensibly, so that it is difficult to determine precisely where it terminates.

Thirdly, Why the bow shifts its situation as the eye does; and, as the popular phrase has it, flies from those who follow it; and follows those that fly from it? the coloured drops being disposed under a certain angle about the axis of vision, which
is different in different places: whence also it follows, that every different spectator sees a different bow.

Fourthly, Why the bow is sometimes a larger portion of a circle, sometimes a leaf? its magnitude depending on the greater or less part of the surface of the cone, above the surface of the earth, at the time of its appearance; and that part being greater or less, as the line of aspect, or axis of vision, is more inclined or oblique to the surface of the earth; which inclination, or obliquity, is greater as the sun is higher: whence, also, the higher the sun, always the less the rainbow.

Fifthly, Why the bow never appears when the sun is above a certain altitude? the surface of the cone, in which it should be seen, being lost in the ground, at a little distance from the eye, when the sun is above 42° high.

Sixthly, Why the bow never appears greater than a semi-circle, on a plane? since the bow is never so low, and even in the horizon, the centre of the bow is still in the line of aspect; which, in this case, runs along the earth, and is not at all raised above the surface.

Indeed, if the spectator be placed on a very considerable eminence, and the sun in the horizon, the line of aspect, wherein the centre of the bow is, will be notably raised above the horizon (considering the magnitude of the circle whereof the bow ufe is to be a part). Nay, if the eminence be very high, and the rain near, it is possible the bow may be an entire circle.

Seventhy, How the bow may chance to appear inverted, i.e. the concave side be turned upwards? viz. a cloud happening to intercept the rays, and prevent their shining on the upper part of the arch: in which case, only the lower part appearing, the bow will foem as if turned upside down; which, probably, has been the case in several prodigies of this kind, related by authors.

Indeed the bow may appear inverted from another cause: for, if when the sun is 41° 46' high, his rays fall upon the smooth surface of some spacious lake, in the middle of which a spectator is placed; and if, at the same time, there be rain falling, to which the rays may be reflected from the lake, it will be the same as if the sun should shine below the horizon, and the line of view be extended upwards: thus the surface of the cone, wherein the coloured drops are to be placed, will be wholly above the surface of the earth.

But since the upper part will fall among the unbroken clouds, and only the lower part be found among the drops of rain, the arch will be inverted.

Eightly, Why the bow sometimes appears inclined? the accurate roundness of the bow depending on its great distance, which prevents us from judging of it exactly; if the rain, which exhibits it, chance to be much nearer, we shall see its irregularities; and if the wind, in that case, drive the rain so that the higher part be farther from the eye than the lower, the bow will appear inclined.

Ninhtly, Why the legs of the rainbow sometimes appear unequally distant? if the rain terminate on the side of the spectator, in a plane so inclined to the line of aspect as to make an acute angle on the left hand, and an obtuse angle on the right, the surface of the cone, which determines what drops will appear, will fall upon them in such manner as that those on the left hand will appear farther from the eye than those on the right. For the line of aspect being perpendicular to the plane of the bow, if you suppose two rectangular triangles, a right and left, the cathetus of each to be the line of view, and the base of the semi-diameter of the bow, inclined as above; it is evident, since those angles of the triangles, next the eye, must always be the same (viz. 43° in the inner bow), the bases of the right-hand triangle will, in this case, appear much longer than that of the left.

Dr. Langwith, in the Phil. Tranf. N.577, describes a remarkable rainbow, in which he observed several series of colours, which increased the bow to a breadth far exceeding what had been determined by calculation. The colours of the primary rainbow, he says, were, as usual; under this was an arch of green, and then alternately two arches of reddish-purple, and two of green, and under all a faint appearance of another arch of purple. The order of the colours was, 1. Red, orange, yellow, green, light blue, deep blue, and purple. 2. Light green, dark green, and purple. 3. Green and purple. 4. Green, and faint vanishing purple.

M. Bouguer frequently saw a phenomenon of this kind, when he was upon the mountains of Peru, where the sky is often extremely serene. Similar appearances have been also observed by others. Dr. Pemberton has attempted to explain them by means of the Newtonian doctrine of fits of easy reflection and transmission; but he goes upon the supposition that the differently-coloured rays have their separate fits, on their arrival at the surface of any medium, without any regard to the thickness of it; whereas it is plain, that, in such a case, all kinds of rays are reflected or transmitted promiscuously. It is most probable that these colours are formed in very minute drops of water or vapour, intermixed with the larger drops, that their formation depends upon the same principle with the colours of thin plates, and that they are similar to those of several kinds of halos. Dr. Pemberton himself observes, that it is most likely that these additional rings of colours are formed in the vapour of the cloud, which the air, being put in motion by the fall of the rain, may carry down along with the large drops. This, he says, may be the reason why these colours appear under the upper part of the bow only, this vapour not defending very low. As a farther confirmation of this, those colours, he observes, are seen strongest when the rain falls from very black clouds, which cause the fiercest rains; by the fall of which the air will be most agitated. Phl. Tranf. abr. vol. vii. p. 140. Priestley on Light and Colours, p. 593.

It has been a subject of controversy among biblical critics, whether the antediluvian atmosphere presented any such phenomenon as a rainbow. The occasion of this debate is a passage in Genesis, ch. ix. 12—17. Mr. Whitehurst, in his "Inquiry into the original State and Formation of the Earth, &c." attempts to establish the probability that the antediluvian atmosphere was so uniformly temperate, as to be subject to no forms, tempests, or rain. The opinion is by no means probable, nor does the above-cited passage warrant any such conclusion. The rainbow was then made the sign or token of God's covenant with Noah, that no such calamity should again take place. unnable denotes a sign or token, and in this sense it is used in the case of Cain, Gen. iv. 15. The mark set upon Cain was, as Shuckford conceives, a sign or token (s) given to him, that he should be preferred from the evil which he deprecated.

Rainbow, Lunar. The moon sometimes also exhibits the phenomenon of an iris, or bow, by the refraction of her rays in the drops of rain in the night-time.

Aristotle says, he was the first that ever observed it; and adds, that it never happens, i.e. is never visible, but at the time of the full moon; her light, at other times, being too faint to affect the sight after two refractions, and one reflection.

The lunar iris has all the colours of the solar, very distinct and pleasant; only faint, in comparison of the other; both
both from the different intensity of the rays, and the different disposition of the medium.

In that mentioned, Philosophical Transactions, N° 331, Mr. Thoreby observes, the largeness of the arch was not so much less than that of the sun, as the different dimensions of their bodies, and their dilations from the earth, should seem to require; but as to its extremities, and the beauty of its colour, it was admirable. This continued about ten minutes before the interposition of a cloud hindered its observation.

RAINBOW, Marine. The marine or sea-bow is a phenomenon sometimes observed in such a highly excited sea; when the wind, sweeping ports of the tops of the waves, carries them aloft; so that the sun's rays, falling upon them, are refracted, &c., as in a common flower, and paint the colours of the bow.

F. Bours, in the Philosophical Transactions, observes, that the colours of the marine rainbow are less lively, less diminutive, and of less duration, than those of the common bow; that there are fears above two colours distinguishable, a dark yellow on the side next the sun, and a pale green on the opposite side.

But these bows exceed as to number, twenty or thirty being sometimes seen together; they appear at noon-day, and in a position opposite to that of the common bow, i.e. the concave side is turned upwards, as indeed it is necessary it should be, from what we have seen in accounting for the phenomena of the solar bow. A coloured bow is always to be seen in the scattered water of a jet, a broken cascade, and the like, when the fun and the spectator are in proper situations. To this class of bows may be referred a kind of white or colourless rainbows, which Mentzelius, and others, affirm to have been seen at noon-day. M. Mariotte, in his fourth Essay de Physique, says, these bows are formed in mists, as the others are in flowers; and adds, that he has seen several, both after fun-rising, and in the night.

The want of colours he attributes to the smallness of the vapours which compose the mist; but we should rather account for it from the exceeding tenueity of the little vulee of the vapour; which being, in effect, only little watery pellicles bated with air, the rays of light undergo but little refraction in passing out of air into them; too little to separate the differently-coloured rays, &c.

Hence, the rays are reflected from them, compounded as they came, that is, white.

Rohault mentions coloured rainbows on the grafs, formed by the refractions of the sun's rays in the morning dew. Tair. de Physt.

Rainbows have been also produced by the reflection of the sun from a river; and in the Philosophical Transactions, vol. i. p. 294, we have an account of a rainbow, which must have been formed by the exhalations from the city of London, when the sun had been wet twenty minutes, and consequently the centre of the bow was above the horizon. The colours were the same as in the common rainbow, but fainter.

The best way of forming a resemblance of a rainbow is to fasten a number of small glass balls, or a number of small glass bubbles full of water, upon a dark board, and to present the board thus furnished to the sun at a proper inclination, which experience easily finds, whilst you turn your back to the sun, and look at the board.

RAINFELDEN, in Geography, a town of Aufrria; 2 miles W. of Rainfelden.

RAINHAM, a township of Norfolk county, in Upper Canada; being the seat township frostng on lake Erie, well of the grand river Lands.

RAINSBRON, a town of Germany, in the margraviate of Anspach; 3 miles N. of Creglingen.

RAINIE LAKE. See Le Plee.

RAJ, a town of Hindoostan, in Malwa; 30 miles S. of Malh.

RAJOOLA, a town of Hindoostan, in Dowlatabad; 18 miles W.N.W. of Konkur.—Also, a town of Bengal; 63 miles N. of Dacca.

RAJOUR, a town of Hindoostan, in Lahore; 36 miles N.W. of Jumma.

RAJOWLY, a town of Hindoostan, in Bahar; 30 miles S. of Bahar.

RAJPOOTANA, a country of the Rajpoots, generally denoting Agimere (which see), and the original country of the founder of the Mahratta state, whose rulers, about half a century ago, aspired at universal empire in Hindostan; but these have been reduced to their present low state, by the depredations of Mahratta detachments, which being composed of light horse, and accustomed to separate into small parties, have, by their defultory movements, at once spread desolation, and eluded the attacks of the inhabitants. This is the fact with regard to the open parts of Rajpootana; the mountainous parts remaining free from their incursions.

Rajpootana was divided into three great principalities, under the names of Oudipour, Joodpur, and Amber (or Amere), now better known by that of Jining, or Jyeqgur. (See each respectively.) In Achar's division of the empire, these principalities were classed as belonging to the foubah of Agimere, sometimes called Marwar. It is not easy to assign the precise limits and dimensions of these principalities, which occupy the space between the western confines of Agra and the north-east part of Guzerat, and between the sandy desert (or Registan) and Malwa; that is, an extent of 320 British miles from N.E. to S.W., and 200 broad in the widest part. Jyingur or Jyeqgur lies to the N.E., Oudipour to the S.W., and Joodpur to the N.W., bordering angularly on the other. Pere Wendell's MS., cited by Rennell, states the revenues of Oudipour at 10 lacks of rupees, Marwar at 40, and Jyingur at 40, per annum, in the year 1779. The whole revenue of the foubah of Agimere, in the time of Achar, appears to have been only about 75 lacks. Aurungzebe is said to have doubled the land-tax on the Rajpoots, and accordingly in Mr. Frazer's account, Agimere is stated at 163 lacks of rupees. The two former, viz. Oudipour and Marwar, are very mountainous, with a sandy soil in the valleys; the latter is the most fertile, and was, about the middle of the last century, in a high state of improvement, under the government of the celebrated rajah Jyingur, or Jefing, who founded the new capital of Jyeqgur, whence the name of the province was changed to that of the capital. Jyeqgur was a place of great wealth and commerce in 1779, being the entrepots of the principal part of the goods that are brought from every quarter of India. The rajah built an observatory in his capital; but the confusions that have for long prevailed in this province, must have greatly reduced the wealth and importance of the capital. Sindia, as Rennell informs us, received the tribute of all the three Rajpoot provinces, and converted it to his use; and he also made considerable conquests in them, particularly in Jyingur. In early times the whole Rajpootana probably constituted one entire kingdom, or empire, under the rana or prince of Oudipour, the head of the Rajpoot states; the antiquity of whose house may be inferred from the name.
RAI

Rhaunae appearing in Ptolemy, nearly in its proper position, as a province. See Oudipour.

The province of Agimere in general (see Agimere) has ever been the country of the Rajpoos; that is, the warrior tribe among the Hindoos, and which are noticed in Arrian and Diodorus; and Chitnore, or Oudipour, (considered by Rennell as synonymous,) is, in his opinion, reckoned the first among the Rajpoits. (See Chitore.) From the Ayin Acbaree we derive some new ideas respecting the division of the foubah of Agimere. It confided at that time of three grand divisions, Marwar, Meywar, and Hadowty, (or Nagore); and these contained seven circars or subdivisions, Agimere, Chitore, Rantamour, Joudypour, Siroyw, Nagore, and Beykeener (or Bacaner). Marwar, as including the circars and fubdivisions of Agimere, has become almost synonymous with Agimere, in commonacceptation. The extent of this province, as given by the fame book, is 168 coffes, or about 320 British miles, from E. to W.; and 150 coffes, or 285 British miles, from N. to S. Such is the province of the Rajpoits. From the indulgence granted to this tribe throughout India, viz., that of feeding on goats' flesh, it may be inferred, fays Rennell, that the custom originated in this mountainous country. The grain cultivated there is chiefly of the dry kind. The taxes amounted, in the time of Achar, to no more than a seventh or eighth of the produce of the harvest. Rennell's Memoir.

RAJPOOTS, the inhabitants of Rajpoottana; which see. They were not confined entirely to the foubah of Agimere; as some inferior tribes of them are settled in Bundelcund, and in Gurry-Mundella. Others, according to Thevenot, are settled in Moultan; and indeed he represents Moultan as the original country of the Kutties, from whom the Rajpoits sprang.

The Kutties or Catries, who formed a particular feet of Hindoos at Moultan, were the Cathets of Diodorus, and the Cateel of Arrian, with whom Alexander carried on war, on the borders of the Mali. The Rajpoits are ordinarily divided into two tribes or chaffes, viz., those of Rathore, and Chohan or Sceofoda. Marwar, or the N.W. division of Agimere, is the proper country of the former; and Meywar, or Oudipour, of the latter. The Rathore tribe were originally the most numerous of the two; and it has been said by colonel Dow, among others, that the Mahratta chiefs had their origin from the Rathore tribe; and in proof of this it has been alleged, that the etymology of the name Mahratta has been deduced from Rathore, prefixing to it "maha,” or great. (See MAHARRATTA.) The Rajpoits are represented by Thavenot as having spread from Moul- tan, their proper country, over all the Indies. Diodorus Siculus distinguishes them by the custom of their women burning themselves alive, on the funeral piles of their husbands; which is indeed a custom among them, as well as some other Hindoos, at this day. Rennell.

RAIPUR, a town of Bengal, on the bank of the Ganges; 10 miles N.E. of Curnockdaugh.

RAISE, in the Mange, is used for working. See Raising.

Raiser is likewise used for placing a horse's head right, and making him carry well, and hindering him to carry low, or to arm himself.

RAISE Tacke and Sleeds, in Sea Language, the order to let them go in the article of tacking, that the sails may be set on the contrary tack they were on before.

To RAISE a Feate. See SEIE.

RAISED AIR. See AIR.

RAISED Plan. See PLAN.

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RAISEN, in Geography, a town of Hindostan, in Malwa; 15 miles S. of Bilph. N. lat. 23° 16'. E. long. 77° 49'.

RAISER, in Building, a board set on edge under the foreside of a step, a slat, &c. See STAIR, &c.

RAISIN, in Geography, a river of America, which runs into lake Michigan, N. lat. 43° 12'. W. long. 85° 42'. —Also, a river of America, which runs into lake Erie, N. lat. 43° 20'. W. long. 82° 55'.

RAISIN Island, a small island in lake St. Francis. N. lat. 43° 5'. W. long. 74° 27'.

RAISIN, or Raifen, Market, a small market-town in the east division of the wapentake of Wallcroft, parts of Lindsey, and county of Lincoln, England, is situated on the banks of the river Raifen, whence it derives its name, at the distance of 15 miles N.E. from Lincoln, and 149 miles N.W. from London. According to the population returns of 1811, it contains 164 houses, and 964 inhabitants. Here is a weekly market on Thursday, and there are fairs every alternate Tuesday, after Palm Sunday, and on the 29th of September. The church is an ancient structure, and is remarkable for the peculiar form of the upper windows in its embattled tower. These have a pointed arch, divided into two pointed lights, and a quatrefoil head. Up the centre runs a strong mullion, crofled by a tranfom, terminating at the impostas, as happens in the church of Yarborough, near Louth, which renders it probable that both edifices were erected by the same architect. The living is a vicarage in the gift of the crown; and by the endowment the vicar is entitled to the usual tythe of ale. Besides the church, there are in Raifin a Roman Catholic chapel, and a Methodiff's meeting-houfe; also a free-school, and an hospital for poor old men.

At a short distance from Market-Raifen, are the villages of Middle and Well Raifen. Middle Raifen was formerly divided into two parishes, called Drax and Tufpholm, but these are now united. At Tufpholm stood an abbey of Premontritenian canons, which was founded in the reign of Henry II., by Alan de Neville, and his brother Gilbert. Previous to the dissolution, it was inhabited by nine monks, whose annual income, according to Speed, amounted to £92. 18s. 6d. The church is a small, but ancient building, consisting of a nave and chancel, which are separated by elegant screen work, beneath a pointed arch, supported by circular columns. The nave appears to have had tide-niles, as the pillars and pointed arches kand in relief from the present wall.

The principal feats in this vicinity are Willingham-houfe, a feat of the Boucherett family; and Thurgundy, the property of Lord Middleton. The latter anciently belonged to the Willoughbys. The house is situated on an eminence, commanding an extensive view over the vale to Swinhope, and is surrounded by pleasure-grounds, finely varied by wood and lawn. Beauties of England and Wales, vol. ix. by John Britton, 1827.

RAISING, in the Mange, one of the three actions of a horse's legs; the other two being the fay, and the tred. The raising or lifting up of his legs in caprioles, curves, &c. is esteemed good, if he perform it hardly, and with ease; not crossing his legs, nor carrying his feet too much out or in; yet bending his knees as much as is needful.

RAISING the LAND, in Sea Language. See Laying the Land.

Raising a Purchase, denotes the act of disposing of certain instruments or machines in such a manner, as that, by their mutual efforts, they may produce a mechanical force sufficient...
cient to overcome the weight, or restistance, of the object to which the machinery is applied.

Raising-Pieces, or Reafon-pieces, in Architecture, are pieces that lie under the beams, and over the pofts or puncheons: thefe lying on the brick-work are called plate-bands.

RAISINS, grapes prepared by drying them in the fun, or in the air; to fit them for keeping, and for some medicinal purpofes.

Of thefe there are various kinds: as, raisins of Damafeus, thus called from the capital city of Syria, in the neighbourhoud of which they are cultivated. They are much used in the composition of fpirits, together with jujubes and dates; they are brought flat, and feeded, of the fize of the thumb; whence it is easy judging of the extraordinary bulk of the grape, when feen. Travellers tell us of bunches weighing twenty-five pounds. Their fhape is faffifht and difagreeable.

Raisins of the fun are a kind of raisins brought from Spain, of a reddifh or blueifh colour, feened, and very agreeable to eat. There are various other forts, denominated either from the place where they grow, or the kind of grape, &c. as raisins of Calabria, Nufcadine raisins, &c.

The finest and best raisins are thofe called in fome places Damafeus and jube raisins. These are the fruit of the raisin Damafcena, and are diftinguifhable from the others by their bargenefts and figure; they are flat, and wrinkled on the surface; soft and juicy within, near an inch long, and fempellelucid, when held againft a good light; they have a feent, agreeable, and vinous fhape; and when feen, and growing on the bunch, are of the fize and fhape of the large olive.

The common raisins are the fruit of feveral species of grape, which are better or worfe, according as they have been more or lefs carefully cured. The raisins of the fun, or jar-raffins, fo called, because they are imported in jars, are all dried by the heat of the fun; and thofe are the forts used in medicine.

The common way for drying grapes for raisins is to tie two or three bunches of them firmly together, while yet on the vine, and dip them into a hot lircium of wood-afhes, with a little olive oil in it. This difpoafs them to fhrink and wrinkle; and after this they are lef left on the vine three or four days, separated on ficks in an horizontal situation, and then dried in the fun at leisure, after being cut from the tree. Some raisins are dried by the heat of an oven; and the difference between thefe and fuch as are dried in the fun, is obfvious; the latter are fweet and pleafant, but the former have a latent aciditie with the fweetnefs, that renders them much lefs agreeable. See Currents.

All the kinds of raisins have much the fame virtues; they are nutritive and bafmifc, but they are very fubjeft to fermentation with juices of any kind; and hence, when eaten immoderately, they often bring on colics. They are allowed to be attenuant, and are given in cafes where the humours are too thick and vivid, and they are faid to be very good in nephritic complaints; they are, however, too familiar in our foods, to be much regarded at prefent as a medicine. They are an ingredient, indeed, in our pectoral decoctions, and in fome other medicines of that intention; in which cafes, as also in others where altrigeny is not required of them, they fould have the ifones carefully taken out. The are used in fome compositions rather with an intent of taking off the nauseous taste of other ingredients, and for obtufing their acrimony, than of doing any extraordinary service themselves

RAISIN-Brandy, a name given by our fpirituals to a very clean and pure fpirit, procured from raffins fermented only with water. Thus treated, they yield a fpirit, fcarce at all diftinguifhable from fome of the wine-fpirits; for there are as many kinds of wine-fpirits as there are of grapes. The caufes of the operation of dilifling is performed in this cafe, the nearer will be the refeimblance of the wine-fpirit; that is, there will be more of this flavour in the fpirit, when as much as can be of the oil is thrown up with a gellong heat.

The diliflers are very fond of the wine-fpirit, with which they hide and difguife the fhape of their rauolous malt, and other fpirits; and in defeft of that fpirit, this of raffins, made in this caufe mofterly, will go aloft as far. It is indeed surprizing how extensive the ufe of these flavouring fpirits is, ten gallons of raffin-fpirit, or fomewhat lefs of the wine-fpirit, being often fimilar for a whole pipe of malt-fpirit, to take off its native flavour, and give it an agreeable visinility. It is no wonder, therefore, that the diliflers, and ordinary rectifiers, are fo fond of this, as it is a good cloak for their defefts, and the imperfection of their procесes.

When raffin-brandy is intended for common ufe, the fire should be kept fluorer and more regular in the diliflation; and the fpirit, though it hath lefs of the high flavour of the grape, will be more pleafant and more pure.

RAISIN-Wine. See Wine.

RAIT, in Rural Economy, a term used to signify the procès or operation of diliflating the fap of vegetables, by exposure to moisturer, or the impaflion of the atmosphere. It is moftly applied to hemp, f lax, or fome fimilar fubftances, and fometimes to hay, when it has been much ex- posed to alternations of wet and dry weather.

When the procès is performed by means of water, as is moftly the caufe with hemp, frequently but not always with flax, and occasionally with other articles of the fame nature, it is ufually denominated water-raifing, and the article is faid to be water-raifed; but where it is effed by ex-pofure to the air, upon the ground, when spread out, it is generally called ground-raifing, and the fubftance is faid to be ground-raifed. In the performance of these operations or procèses with hemp, flax, and fuch like fubftances, there is great necefly and attention required to fee that they are carried to a fufficient length, without going too far, fo as to injure the textures of the fubftances in their cortical parts. This may probably be accomplished with the greateft certainty by the frequent examination of the materials themselves; keeping them perfectly under the water in the former cafe, and frequently turned with new surfaces to the atmosphere in the latter, never having the graffy furface on which they are spread out of too great a length. The effects of heavy rains, when long continued, might likewise be carefully attended to in this latter infance. See Flax, Hemp, and Water-raifing.

RAITAPOUR, in Geography, a town of Hindooftan, in the circar of Rajamundry; 12 miles N. of Rajamundry.

RAITCH, in Rural Economy, a term signifying a line or fift of white, down the face of a horse. It is a very common mark in the faces of horses.

RAITENBACH, in Geography, a town of Germany, in the principality of Culmbach; 8 miles E.N.E. of Wonfiedel. Also, a town of Bavaria, in the bishopric of Aich- fladt; 8 miles N. of Aichfladt.

RAITENBURG, a town of the duchy of Carniola; 3 miles N. of Rudolfswehr.

RAITING, GROUND, in Rural Economy, that method of rafing or accomplishing the separation of the barks or coverings of the fleins of flax, hemp, and other fimilar plants,
RAK

by means of spreading them out in a thin manner upon close
grassy surfaces, instead of putting them into ponds or pools of
flagrant water, in order that they may be expelled to the
atmosphere. It is occasionally employed for flax and other
small flaked plants, but seldom or never for hemp and those
which have large ones. It is a practice which stands in need of
considerable attention and management. See Rait.

RAJUAPUR, in Geography, a town of Mocum-
pour; 18 miles S. of Bargao.

RAIVATA, in Hindoo Mythological History, one of the
saints or fages included in the denomination of Menus. Rai-
vata is said to have been the son of Agni, the regent of fire,
also called Pawaqa, (which bee), and Menu.

RAJYA, in Geography, a town of Hindoostan, in Ba-
har; 20 miles E.S.E. of Bahar.

RAKAPORAH, a town of Hindooftan, in the circar
of Juffpour; 10 miles N.E. of Odeypour.

RAKAS, a town of Transylvania, on the Alaut; 16
miles N.W. of Cronstadt.

RAKE, in Agriculture, a tool of the toothed kind, made
use of for many purposes of husbandry, as for collecting to-
gether hay, corn, flubble, roots, leaves, and other fimilar
forts of materials. It is a very useful and convenient kind
of tool in all fuch intentions. There are many defcriptions
of this fort of implement.

RAKE, Bean-Stubble, a tool of the rake kind, constructed
for the purpose of clearing bean-stubbles. It is employed on
some farms in Essex, as by Mr. Ketcher, at Burnham,
where it is found to be well-adapted to this use, and to do
its work in a perfect manner. The head, which is seven
feet eight inches in length, is formed with a very flight
curve, having teeth fef in it in rather a clofe manner, which
are one foot and a half in length, bending or curving a little
forwards at the points. It is attached by a frame to the
axle of the wheels, which is three feet two inches long; and
the wheels are two feet fix inches in their diameter. The
hooks and shafts for the horfe are four feet in length. This
is a very fimple contraction of this nature, and one which
is capable of eafy application. The teeth fhould be made
ftrong, whether they are of wood or iron. This is an im-
plement which wants to be better known in other districts.

RAKE, Corn, a large frong rake, made fef of in dif-
ferent districts for bringing together the moving grain crops.
It is sometimes constructed with wooden teeth, but a better
mode is to have them of iron, being a little bent forward,
having the length of seven or eight inches. As it requires
much exertion to perform the work with them, they fhould
always be made as light as possible, fo as to have fufficient
power to perform the work. It has been ftrated by Mr.
Somerville, in his Agricultural Survey of the District of
East Lothian, that though the common hay-rake is mostly
used there, a different kind for grain has been partially tried,
and found to answer the purpofe much better. In this, the
length of the head is from ten to fifteen feet, the handle
about seven feet, with a piece of wood across the end of it,
by which it is drawn by two men. The teeth are of wood
or iron; the left are the bell, as well as the moft durable,
and are a little bent forward at the point, which gives them
the power of retaining and carrying the ears along with
them, much better than they would otherwife do. To
make clean work, efpecially if the ridges are gathered, the
field is raked across: in that way, every thing is taken up.
But when it is preferred to draw the rake in the direction
of the ridges, it may be considerably improved, by cutting
the head into two or three leaths, and joining them with
hinges, which will allow it to bend and accommodate itself
to the curvature of the ridges. The advantage of this kind
of rake has been found considerable, even in cafes where
every possible attention has been paid to the cutting of the
crop; but it frequently happens, that, owing to the damp-
ness, greenness of the straw, or a foul grasy bottom, it is
necessary to leave the crop unbound for a day or two, during
which, if it be overtaken by a high wind, much of it will
be scattered and loft, unless considerable pains are taken to
gather it by hand-raking, or otherwife. Where the long
rake is used for that purpofe, the expence will in no in-
stance, he thinks, exceed four-pence fterling per acre. An
experiment made on a field of 30 acres, will convey some
idea of the benefit that may be derived from the use of that
instrument. The field was in barley, and the rakings, when
threshed, yielded

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Total produce 14 5 0

Expenf of raking 31 acres, at 4d. per acre - - 0 10 4
Bread and beer to the rakers - - - 0 1 6
Carting from the field, stacking, &c. - - - 0 2 6
Threshing - - - 0 7 6

Total expence 11 10

Which deducted from 14l. 5s., leaves a profit of 13l. 2s. 2d.
fterling. It is neceffary to obferve, that about ten acres of
the field were left unbound, and a good deal disorderd by
a high wind; but as confiderable pains were taken in the
binding, the proportion obtained from the ten acres did
not greatly exceed what was got from the ref of the field,
the whole of which was cut with a great deal of care.

But though this mode of working the rake affords con-
siderable profit and advantage, they would be a great deal
more, by having recourse to horfes in the draught of them.
One horfe in each would do as much labour as several
men in a given time; and by having shafts and low wheels fef-
d to the tool, it could be readily adapted to this method of
being wrought.

RAKE, Couching, a large fort of strong horfe-rake, with
long round fomes or teeth, crooked or bent forward in a
gentle manner, and placed about two inches diliant from
each other; and a small beam in the middle, with fide
pieces, and an apparatus for attaching the horfe to it. It
is found very useful in bringing together the roots of couch,
and other wefts, in order to their being burnt, or carried
off the land, and in other ways destroyed. See Couch-
Rake, Quick-Rake, and Rake-Twist.

RAKE, Dew, a fort of large rake, or hand drag, so
named from being used before the dew is off the ground, or
other fort of harvest work can be begun. It is a powerful
convenient fort of implement for harvest work.

RAKE, Garden, a well-known fort of tool for raking
the ground, as well as for putting in seeds, &c. In
order to fuit every kind of gardening work with rakes,
there should be three or four different fizes, from about fix
to eighteen inches long in the head, having handles from fix
to eight feet in length, and the heads toothed with iron teeth
two or three inches long, being placed from one to two
inches afunder, according to their refpective fizes. The
first or largest rake fhould have the head about fifteen to
eighteen inches long, the teeth three inches, and placed two
inches afunder, which is proper for raking flubborn or
rough dug ground, and for putting in large kinds of feeds,
raking off large weeds after hoeing, and many other pur-
poses.
poses in large gardens. The next size should have the head twelve inches long, the teeth three inches, being placed one inch and half afender, which is proper for all common raking in ordinary light ground, and for raking in most kinds of small feeds, as well as other purposes. A third fort of small rake should have the head about nine inches long, the teeth two and a half, being placed one inch afunder; proper for fine raking beds, borders, &c. and raking in some particular fine feeds; as well as between rows, &c. of certain plants occasionally, where larger rakes cannot be introduced. And the smallest fort should have the head fix inches long, the teeth two and a half, and placed one inch afunder; being very useful for raking between small plants in beds and borders, and other small parts, where the plants stand close, as well as several other purposes of that kind.

It may be noticed, that all these forts of rakes are constructed both with wooden heads and iron teeth, and with the heads and teeth wholly of iron in both; of which the teeth are generally flattened, the back edge rounded off, and narrowing gradually to the point; the other straight, and placed on the heads edgeways acros, with the back edge outward, and with the points all inclining very moderately inward, in a regular manner: the wooden-headed rakes having each end of the head hooped with a thin flat iron ring, to secure it from splitting. It is very seldom that wooden teeth are employed in this way, or for these uses.

Those of the first fort are generally the lightest and cheapest, being proper for any kind of garden raking; but the latter, or iron-headed rakes, when made neat and as light as possible, with the teeth well set, in a proper position, and firmly fastened, are equally proper, and in some cases preferable, as in some wetthift or moist soils, as not being liable to clog so much as wooden rakes, and at the same time more durable. They are, however, more proper for middling and small rakes than for large ones; as, in strong raking, the teeth are more liable to get hoof than in the wooden-headed rakes.

Both the forts, in their different sizes, are sold at the principal ironmongers' shops, both with and without handles.

And rakes having the heads, teeth, and handles, wholly of wood, may sometimes be used for particular purposes; such as raking in light kinds of kitchen-garden feeds in light ground, and taking off large hood-up weeds in wide clear spaces, raking up swaths of mowed short grasses before the sweepers, &c. fallen leaves of trees in autumn, and clipings of hedges, &c. as well as several other uses about the pleasure-garden.

Rake, Hay, a well-known tool, with short teeth and a long handle, made use of in making hay. It is usually made of willow, or some other similar wood, in order that it may be light and handy. The teeth should not be too long, as, when that is the case, they are apt to hang and pull among the stubs of the grasses in raking with them, and thereby retard the operation, as well as cause much fatigue to the labourer.

Different improvements have been made on this implement. A late useful alteration is the making the teeth to screw into the head, and fasten with screw nuts, by which the inconvenience of their dropping out in dry grass is obviated. It has been observed, that with the stop-teeth rake, the operator is capable of performing much more work than by the common one. They are likewise capable of being conveniently made use of both for hay and corn. They were originally made and sold by Mr. Corot, of Leiceter.

Another improvement is mentioned in Young's Agricultural Report of Norfolk, which is the addition of wheels. It is flatted, that the "hand wheel-rake" of Pleg is an excellent implement for both hay and corn: it is to answer the purpose of the common hay-rake, and is about four feet long in the rake; and the two wheels, of nine inches diameter, so fixed, that the teeth are kept in any posture, at the will of the holder.

In some parts of Lancashire, they make use of a large horse-rake for collecting the hay together, and raking it up from the ground, which is found to be highly convenient and beneficial; as one horse, in one of these rakes, will perform as much labour as a great number of men, in a certain space of time; and besides the expedition, the work is considerably better done, in consequence of the greater weight of the implement.

The head of the rake has something of a large easy half circular form, into which two strong pieces of wood are fastened, which constitute the shafts for the horse. There are two low wheels behind, and the head has long teeth, curving a little forward, fixed into it at two or three inches from one another. The teeth may be made either of wood or iron, and should have considerable strength. The whole has no great weight, though it must obviously be considerably heavier than the common rake; which is found of much advantage in its working, as has been hinted at above.

Rake, Horse Stubble, an implement used in Norfolk and Suffolk, on the large and middling-sized farms, and, from its great utility, extending itself to other districts. It is employed for barley and oat crops, being drawn by a horse. And it has been flated by Mr. Young, that one man and a horse, driven by means of a line or rein, are capable of clearing from twenty to thirty acres, in a moderate day's work; the grain being deposited in regular rows or lines across the field, by simply lifting up the tool, and dropping it from the teeth, without the horse being flopped. It cools from four to five pounds.

Figures of it may be seen in the above Agricultural Reports. Horses have now been employed for working other forts of rakes, and found of great advantage, as has been already seen.

Rake, Horse-rake, a large heavy kind of horse-rake, having strong iron teeth, fourteen or fifteen inches in length, placed at five or six inches from each other, and a beam four inches square, and eight or ten feet in length. In drawing it, two horses are mostly made use of, by which it is capable of clearing a considerable quantity of stubble in a short time. Tools of this fort are highly useful on corn farms, for collecting this useful material, and should be much more frequently employed than they are at present.

Rake, Twitch, a large horse-rake, employed in certain cafes for clearing lands from the roots of couch, twitch, or quitch-grasfs, as well as those of other forts. It is constructed in different ways, as with one or two rows of teeth; but the latter is probably the best method, as by placing one row opposite the intervals of the other, it must be rendered a very efficient tool.

Rake of a Ship, is to much over her hull as overhangs at both ends of her keel.

That part of it which was before, is called the rake forward-on; and that part which is at the setting on of the stern-post, is called her rake-off, or afterward-on.

When a ship hath but a small rake forward-on, but is built with her stern too straight up, she is called huff boiler.

Rake of the Rudder, is the hindermost part of it.

Rake, among Hunters. See Rag.

Rake, in the Mange. A horse rakes, when being shouldered-ploaid, or having strained his fore-quarter, he goes to lame, that he drags one of his fore-legs in a semicircle; which
which is more apparent when he trots, than when he
paces.

RAKE, or Vein, in Geology, the most common repository of
metallic ores. These veins intersect mountains nearly
vertically, or more or less inclined from the perpendicular.
They are filled with ores, intermixed with the peculiar
minerals accompanying each kind of metal. They vary
from a few inches to some feet or yards in width, and ex-
tend to a very considerable depth and distance. The upper
side of the vein is provisionally called the hanger, and the
lower side the ledger; and the inclination from the perpen-
dicular is called the hade of the vein. For a particular ac-
count of the structure and formation of veins, see Veins,
Metallic.

RAKEL, in Geography, a town of Dobruzzi Tartary,
on the Danube; 15 miles W. of Iakski.

RAKESBURG, or Rakelsburg, a town of the duchy of
Sturia, situated on an island in the Muhich; the inhabitants
of which carry on a considerable trade with Hungary and
Croatia; 36 miles S.E. of Gratz. Lat. 46° 45'. E.
long. 15° 36'.

Raking signifies sloping or winding, as when a wall
is not built up right or slanting.

Raking, in Agriculture, the operation of performing
work with a rake. It is a sort of work that requires little
art or trouble in its execution; but whether performed with
the common or horse-rakes, it should always be done in an
effectual manner. In the business of hay-making, clean
raking not only affords a neatness in the appearance, but,
over a great extent of surface, a considerable saving of hay.

In raking hay lands, where horses are employed, some
degree of care is necessary in directing the work, and driving
the animals, in order that no inconvenience of delay may be
experienced, and that every part of the land may be gone
over in the most regular manner. Small boys may serve to
direct the horses by riding upon them, and some faving be
made in that way.

In raking cut corn crops with horse-rakes, especially
those of oats and barley, it is sometimes the best method to
proceed in a cross direction of the ridges, drawing up the
produce into long rows at suitable distances; the horses
being driven by the men, who know the management of the
handles of the rakes, by means of whip reins brought from
the horses to the flits of the implements. It seldom hap-
ens that so good work can be made in going the length-
ways of the lands, particularly where they are much
rounded, and of a small fize in breadth, as the tools will
not fit well to their rounded form, unless where they are
constructed in separate parts in their heads, so as to admit
of motion by means of joints. In this mode of raking, the
corn may sometimes be readily tied up into sheaves.

But in the raking of flutters, it is more useful to pass in the
direction of the ridges, though the contrary method is
not unfrequently had recourse to. In those cases, as well
as in the others, the flauy grains or flutters are always
brought together into lines or rows, in order to be more
readily taken up by the carts either bound or unbound.

In the raking of the roots of weeds together upon lands,
it is constantly the best practice to perform the work in
both directions; as, by such means, the whole of them may
be laid hold of in a more complete and effectual manner than
could otherwise be done. See Rake.

Raking, in Gardening, a necessary operation in the gar-
den, to break the surface of the soil small, and render it
fine for the reception of particular sorts of small seeds and
plants, previous to sowing and planting; as well as to render
it neat and even to the eye. It is also employed in raking in
seeds, as being an expeditious mode of covering them in.
In all kinds of small seeds, or hardy plants, the ground
being dug, &c. and the surface remaining rough after the
spade, the seed is sown, and then raked in with an even
hand, once or twice in a place, as a back and a fore stroke,
or more as may be necessary.

And this operation is useful also among growing plants,
that stand distant enough to admit the rake, particularly
where the surface is inclinable to bind, or where numerous
small seed-weeds appear, as it loosen the soil, and retards
the growth of the weeds, and promotes the growth of the
young plants. It is also good culture at particular feasons,
to annoy flags, especially in kitchen-gardens, to rake be-
tween the rows of small plants in autumn and winter, &c.
The raking of the beds, borders, and other compartments
of pleasure-grounds, now and then, smooth and even, like-
wise gives an air of culture and neatness to the whole.

It may be observed, that this sort of work should gen-
erally be performed in dry weather, and when the ground is
also moderately dry; as when done in rainy weather, or
when the ground is very moist and cloggy, the surface is
apt to cake and bind hard. This should be well attended to
in sowing seeds. Rough ground does not rake well,
when it is become very dry at top, especially if it was dug
wet, and suffered to lie till the clods have become very dry
and hard; in which case it will not rake well, until mello-
rowed or pulverized by a shower of rain. But common
light garden ground generally rakes best when fresh dug,
perhaps the same day, or day after the farthe, before
dried too much by the sun and wind, or rendered wet by
rain, &c. The operation should, however, be performed
when the ground is in such order as the clods will readily
break and fall to pieces under the rake, without clogging
much to it, or the mould become even without running into
lumps.

Raking of a Horse, is the drawing his ordure with the
hand out of the fundament, when he is coltive, and cannot
dung. In order to do this, the hand must be anointed with
fellad-oil, or butter.

Raking a Ship, is the act of cannonading a ship on the
stem or head, so that the halls shall ficur the whole length
of her decks, which is one of the most dangerous inciden-
ties that can happen in a naval action, so much so, that the
men are ordered to lie down at their quarters. This is fre-
nently called raking fore and aft, being the fame with what is
called enflagging by engineers. See Enfilade.

Raking Knees. See Knees.

Raking Table, or Raked Table, among Architect, a mem-
ber hollowed in the square of a pedetalf, or elsewhere. See
Cavetto, and Scotia.

Rakokie, in Geography. See Raci-koke.

Rakonitz, or Rakownitz, a town of Bohemia,
and capital of a circle of the same name, which is moun-
tainous and covered with forests, but fertile in corn,
and affording some excellent horses. It was made a royal
town in 1586. It is celebrated for its beer, which is the prin-
cipal article of its commerce; 22 miles W. of Prague. N.
lat. 50° 5'. E. long. 13° 57'.

Rakora, a town of European Turkey, in Bulgaria;
40 miles S.S.E. of Viddin.

Rakow, or Racow, a town of Aulrian Poland,
in the palatinate of Sandomirz, formerly populous; the Soci-
arians had a college and printing-house here, but were ex-
peled in 1643; 40 miles W. of Sandomirz. See Racow.

Rakoweena, a harbour on the coast of Kamih-
chatka, in Asian bay, three miles long, and one and a
half
half broad, with water from thirteen to three fathoms, and a bar at its entrance: it runs at first in a south-eaft and afterwards in a southerly direction; three miles S. of St. Peter and St. Paul.

RAKSHA, in Hindu Mythology, a species of malignant demon, of whom great ufe is made in their epic machinery and popular tales. They are of various flapes and colours, and suppeded to be animated by the souls of bad men of earlier existence, receiving punishment in these forms as enemies to the gods, and obstructors of their beneficent intentions towards mankind. Another clafs of these evil genii comprehend those called Yaksha. Rakshasa and Yakshas are the plurals, and Rakshni and Yakshni the feminine; for these evil doings are not confined to sex. Ravana, the giant king of Lanka, or Ceylon, who opposed Rama, aided by the gods in the invasion of his kingdom, is sometimes called the lord of Raksha. See Ravena.

RAKULSKOI, in Geography, a town of Russia, in the province of Ufling, on the Dvina; 20 miles N. of Krafneobors.

RALEIGH, Sir Walter, in Biography, a distinguished character in the reigns of queen Elizabeth and James I., was second son of a gentleman of an ancient family in Devonshire. Few names, says Sir Walter’s biographer, Mr. Cayley, vary so much in the manner of writing it. By Sir Robert Naunton and Lord Bacon it is written Raleigh; in some old deeds the orthography is Rale or Raleigh; while king James, Hooker, and other respectable writers, adopt the mode of spelling which is still common in this country, viz. Raleigh; but the original letters of Sir Walter himself, wherever the signature is preferred, have Raleigh, and on that account we choose to adopt it in this work. Sir Walter, of whom we are treating, was born at a farm called Hayes, in that part of Devonshire that borders on the sea, in the year 1552. By his mother he was related to those famous knights, Sir John, Sir Humphrey, and Sir Adrian Gilbert. After he had received the usual school education, he was sent to Oriel college, Oxford, where he distinguished himself by a proficiency in learning far beyond his age; but the active disposition and martial ardour with which he was endowed, soon put an end to his learned career. About the year 1569, he, in company with many young gentlemen of the best families in the country, went into France, as well to instruct themselves in the art of warfare, as to assist the Protestants in that kingdom, who were then grievously oppressed. In this school he was employed five or six years, but by what means he escaped the horrible massacre of Paris, and the provinces, on the famous St. Bartholomew’s day, we have no knowledge. He returned to England in 1575, and it should seem he immediately became a refident in the Middle Temple, whence a commendatory poem of his, prefixed to a work of George Gafcoigne’s, is dated in 1576. That he was not a student in the law, at this time, he has himself declared, and he shortly after passed into the Netherlands, where he served some time against the Spaniards. In this, and other transactions of the same kind, he followed the fashion of the times. France and the Netherlands were in those days the schools of Mars; to which all were obliged to resort who meant to pursue the fortune of arms. Many young men returned to their native country ruined in their fortunes, their constitution, and morals; but Raleigh had made a good use of his time, gained a large flock of useful knowledge, and was so completely polished in his manner of address, that he was now considered as one of the best bred and most accomplished gentlemen in England.

On his return in 1578, he found his half-brother, Sir Humphrey Gilbert, engaged in a design of making diffic-

versies in North America, for which he had obtained a patent, and for the furtherance of which he had procured the affil-

iance of many friends. Raleigh was delighted with the design, and embarked in it cordially. This project proved very unfortunate to the adventurers, but it gave young Raleigh an introduction to the sea service, in which he afterwards so much distinguis hed himself. From this unlucky adventure, Mr. Raleigh arrived safe in England in the spring of the year 1579, and very soon after he appears to have offered his services to the queen to go to Ireland, to the inhabitants of which, pope Gregory VIII., and the Spaniards had sent men, money, and other assistance, to enable them to take arms against the established government. He obtained a captain’s commission, and served in Munster under the earl of Ormond. In this petty warfare he displayed so much good conduct, vigour, and courage, that he was afterwards made governor of Cork; and as a reward for his services, he received from the crown the grant of a considerable estate in Ireland. A misunderstanding with the lord-deputy Grey put a stop to his farther rife in the army; he returned to England, and was quickly introduced to the queen’s notice, and by his own merits attained a large share in her favour. As he was forward to distinguish himself in all public services, so on the return of the duke of Anjou into the Netherlands, he was one of those who accompanied him out of England, by the express command of queen Elizabeth, and on his coming to England in 1582, he brought over the prince of Orange’s letters to her majesty. Some months after this he refided at court, and was honoured with the favour and protection even of contending families, who were proud of showing the true judgment which they had of real merit, by becoming patrons to Raleigh. In 1584 he was married in his brother Gilbert’s second attempt, and though he did not venture in person, yet he built a new ship, called the bark Raleigh, and furnished it completely for the voyage; “the unsuccessful end of which,” says Campbell, “it seemed to predict, by its untimely return in 48s than a week to Plymouth, through a contagious distemper which feized on the ship’s crew.”

While at home Raleigh was not negligent of putting his fortune as a courtier. “He had a good perfon and address, made an elegant appearance, and put on that air of gallantry which was so meritorious in the eyes of Elizabeth. It is said, that he was once attending the queen in a walk, when she came to a spot, that by its site obstructed her course; he immediately took off his rich cloak, and spread it on the ground for her to walk on. Pleased with this attention, it is observed, that the facrifice of a cloak obtained for him many a good fuit.” The enterprising spirit of Raleigh was fhewn in the year 1584, in a scheme which he formed of making discoveries and settlements in those parts of North America which had not been subjected to any European power. His interest at court, and his ability in flating and letting forth his plans to the, best advantage, obtained for him an extenfive patent for executing his purpose; and, in confequence, with the help of a society of his friends, he fitted out ships under the command of captains Amadas and Barlow, which failed from Plymouth in that year, and took poftilion of an isle near the mouth of Albemarle river, in what is now called North Carolina. From the terms of the patent, it appears, that the great object of these adventurers, as it was of all others in that reign, was the search after mines of the precious metals. Raleigh was not himself in this expedition: the ships returned in the autumn with some commodities which sold so well, that the company was encouraged to fit out a fleet of seven vessels for the following year, of which the command was given to
On his return from his Portugal voyage he visited his Irish estates, and there either formed or renewed his acquaintance with the poet Spencer, who celebrates him under the title of the "Shepherd of the Ocean," and acknowledges the obligation of having first made him known to the queen. To his Fairy Queen he likewise prefixed a letter to Raleigh, explanatory of its plan and design. The patronage of literature was one of the best traits in the public characters of an age, in which means was singularly mixed with heroism. The naval enterprises of the reign of Elizabeth were for the most part predatory expeditions, and often on foot by individuals for their private benefit, and encouraged, though not feebly aided, by the crown. In 1592 Sir Walter Raleigh engaged in a considerable undertaking of this kind, with a view of attacking Panama, and intercepting the Spanish Plate fleet. He fitted out thirteen ships, by himself and his associates, which were joined by two of the queen's men of war, and he was appointed general of the whole fleet. Scarcely had he set sail when he was recalled by his sovereign; proceeding, however, to Cape Finisterre, he divided his fleet into two squadrons, with cruizing for orders, and then returned. One of the squadrons fell in with a rich wreck, the capture of which was the only instance of success which attended the expedition. His ardour for war was shown by his support in parliament of a motion, that certain subsidies granted to the crown should be for the express purpose of carrying on a war offensive and defensive against Spain. To undermine his credit with the queen, Parsons, a Jesuit, published a libel against him, charging him with Atheism: the queen is said to have imbibed some prejudice against him on this account, but he incurred her heavy displeasure by an intrigue with one of her maids of honour, the daughter of Sir Nicholas Throgmorton. The consequences of this amour brought a fœcadula upon the court of the virgin queen; and though he made the best repayment in his power, by marrying the lady, his offence was punished by an imprisonment in the Tower of some months, and a subsequent banishment from the queen's presence.

During his imprisonment he projected an expedition for the discovery of the empire of Guiana, which had already been visited by the Spaniards, and the extent and opulence of which had been the subject of many marvellous tales. Having obtained some preliminary information, from an old navigator whom he dispatched for the purpose, he embarked in person, in the month of February 1595, with a squadron of ships fitted out at a great expense, and failed to the island of Trinidad, where he made himself master of the town of St. Joseph; he then proceeded up the great river Oronoko, but was obliged by the heat of the weather, and the difficulties of the navigation, to return, with doing nothing more than merely taking possession of the country in her majesty's name. Unwilling to return without appearing to have done something, he published a work, entitled "Discovery of the large, rich, and beautiful Empire of Guiana," which was evidently the refult of a fertile imagination rather than of real observation, and which Hume rigidizes as a production "full of the groffest and most palpable lies that were attempted to be imposed on the credulity of mankind."

Sir Walter had so far regained the good opinion of the queen, that he had a naval command in the expedition against Cadiz, in 1596, under the earl of Essex and Lord Ellingham. In the attack he was one of the leaders of the van, and by his valour and prudence contributed a full share to the success of the glorious action. In the following year he sailed as rear-admiral in the expedition of which Essex was commander-in-chief, and the purpose of which was to intercept the Spanish West India fleet. Arriving first with
Ralegh.

It is said that even Coke, the attorney-general, who treated Ralegh on his trial with all the abuse that belonged to his character, and was thought authorized by his office, expressed surprise at the sentence, and declared that he had charged him with no more than misprision of treason. Three were executed for this plot, two were pardoned, and Ralegh was only reprieved and committed to the Tower. His wife, at her own earnest solicitation, was permitted to become his fellow-prisoner, and his youngest son was born in the Tower.

In Mr. Cayley's life of Sir Walter Ralegh, published in London in 1806, we have a curious letter of Lord Cecil, then secretary of state, to Sir Thomas Parry, the English ambassador in France, in which he gives an account of the conspiracy just referred to, and of the motives which led the different persons to take a part in it. Sir Walter was indicted for conspiring to deprive the king of his government, to raise up faction within the realm, to alter the religion and bring in the Roman superstition, and to procure foreign enemies to invade the kingdom. The principal overt act in the indictment was, that Sir Walter had a conference with Lord Cobham, as to the best means of advancing Arabella Stuart to the crown and throne of this kingdom, and that they should apply to the king of Spain to procure his assistance in this cause. Sir Walter made an able stand in his trial against the legality of conviction upon the evidence of a single witness, but the judge, rendered infamous by his conduct on the trial, overruled the objections.

The active mind of Sir Walter Ralegh was now left to exert itself within the walls of a prison, and its employment conducted more to his honour than his liberty perhaps would have done. Here he composed the greater part of his works, especially his "History of the World." Prince Henry, a youth of most amiable qualities, and as unlike his father as possible, contracted a generous admiration for the splendid talents of Ralegh, and cherished him in his solitary confinement by his friendship and correspondence. "No king," said the royal youth, "but my father would keep such a bird in a cage." Henry, however, died, and with him the hopes of deliverance vanished from the mind of the state prisoner. 

At length, however, after twelve years' confinement, Sir Walter obtained his liberation, but probably not without the use of bribes, applied to the new favourite Villiers. For the purpose of repairing his fortunes, he planned a new expedition to Guinea, and his report of a rich gold mine existing in that country was a sufficient inducement for a number of adventurers to engage in the scheme. He obtained a patent under the great seal from the king, for making a settlement in Guinea. James, however, in order to retain his hold upon him, did not grant him a pardon of the treasons of which he had been convicted. There is no doubt but Sir Walter might have purchased a pardon, and, at one time, had thoughts of doing so. He even consulted Sir Francis Bacon, whether it would not be advisable for him to give a round sum of money for a pardon in common form; to which the learned lawyer answered, "Sir, the knee timber of your voyage is money; spare your purse in this particular, for, upon my life, you have sufficient pardon for all that is past already, the king having under his broad seal made you admiral of your fleet, and given you power of the martial law over your officers and soldiers." Ralegh having employed all his resources in fitting out the expedition, failed for Guinea with twelve armed vessels in July 1617. He had not even long before he was obliged to put into the harbour of Cork, by frows of weather, where he remained till the 10th of August. In November he arrived at Angola.
Guiana, where he was received with the utmost joy by the Indians, who not only rendered him all the service in their power, but endeavoured to persuade him to end all his labours there, and take upon himself the sovereignty of the country, which, however, he readily refused. A violent and long continued sickness prevented him from undertaking the discovery of the mine in perfon. This important affair he entrusted to one of his captains, Keynes: the scheme, however, proved abortive, the Spaniards having been before hand with him in the search of gold. Hume, for the purpose of elucidating James, endeavours to show that the real intention of Sir Walter Raleigh was to plunder the Spanish settlements, and neither to colonize, nor to work the mines. He assumes that Raleigh was a wilful deceiver in the expectations he had raised of vast subterraneous riches; but considering his character, it is surely more reasonable to believe that he was carried away by some vague ideas of this kind, and Hume admits that the Spaniards were at the very time working some mines. It will be readily admitted, that James did not imagine he was giving Raleigh a commission of holilities against Spain, yet he must have known that the exclusive claims of that crown in South America rendered every interference with its dominion hostile in its eyes. The fact seems to be, that the expedition was undertaken with an intention to make the most of it, by any means within the power of the armament, and that the commander trusted to its success for justification before a court where bribery to favourites was omnipotent.

In this expedition Raleigh's elder son lost his life, of which, and of the unfortunate issue of Keynes's undertaking, he reproached his captain very severely, who, without hesitation, put an end to his own life. Raleigh, with a heavy heart, fled to homelands. In July 1618 he arrived at Plymouth, and in his journey to London he was arrested, and carried back to Plymouth. Twice he attempted to escape, but was secured and committed a prisoner to the Tower. James was exasperated at the injury which had been inflicted on Spain, a power then in amity with England, and which had been complained of by the Spanish court in very strong terms. He was, moreover, about to enter into a more intimate connection with that court, and therefore, without hesitation, determined to sacrifice Raleigh to its resentment. Though his death had been determined on, it was difficult to take away his life. His conduct in the late expedition, though the want of success had rendered it criminal in the eyes of the court, was far from being in the sight of the nation; and though judges might have been found who would pronounce it treason, yet even in those days it was not easy to find a jury who would, without evidence, have found him guilty. The commissioners therefore, who had been appointed to inquire into the matter, and who had frequently examined him, finally reported, that no ground of legal judgment could be drawn from what had passed in the expedition. Upon this, it was resolved to call him down to judgment upon his former sentence, which, says Campbell, was done, with all the circumstances of iniquity and brutality that can well be conceived. Being brought before the court of king's bench, his plea of an implied pardon, by his having acted under the king's commission since sentence had been pronounced, was overruled, and he was not permitted to enter into a vindication of his conduct in the late voyage. Execution was accordingly awarded, and the king's warrant for it produced, which had been signed and sealed before-hand.

"That this judgment was illegal," observes Dr. Campbell, "and that Sir Walter was really murdered, has often been said, and, I believe, seldom doubted; but I think it has not been made so plain as it might be, and, therefore, in respect to his memory, I will attempt it, by shewing that the judgment was absolutely illegal, as well as manifestly iniquitous.

"It is a maxim in our law that the king can do no wrong; and most certain it is, that no king can do legal wrong, that is to say, can employ the law to unjust purposes. Sir Walter Raleigh, after his conviction, was dead in law, and, therefore, if king James's commission to him had not the virtue of a pardon, what was it? Did it empower a dead man to act, and not only to act, but to have a power over the lives and estates of the living? It either conveyed authority, or it did not. If it did convey authority, then Sir Walter was capable of receiving it; that is, he was no longer dead in law: or, in other words, he was pardoned. If it conveyed no authority, then this was an act of legal wrong. I cannot help the blunder; the absurdity is in the thing, and not in my expression. A commission under the privy seal, if not under the great seal, granted by the king, with the advice of his council, to a dead man; or, to put it otherwise, a lawful commission given to a man dead in law, is nonsense not to be endured; and, therefore, to avoid this, we must conceive, as Sir Francis Bacon, and every other lawyer did, that the commission included, or rather conveyed, a pardon. Indeed, the same thing may be made out in much fewer words. Grace is not too strong a mark of royal favour as trust; and, therefore, where the latter appears, the law ought, and, indeed, does, presume the former. This judgment, therefore, did not only murder Sir Walter Raleigh, but, in this instance, subverted the constitution, and ought to be looked upon, not only as an act of the basest prostitution, but as the most flagrant violation of justice that ever was committed."

The sentence of death was pronounced on him one day, and put in execution on the following, Oct. 29, 1618, in Old Palace Yard. His behaviour on the scaffold was calm and manly. He addressed the people at some length; he said he never feared death, and much less at that time; that as to the manner of it, though to others it might seem grievous, yet for himself, he had rather die in this way than in a burning fire. He desired to see the axe, and feeling the edge of it, said to the sheriff, "this is a sharp medicine, but a sure remedy for all evils." Being asked which way he chose to place himself on the block, he replied, "to the heart be right, it is no matter which way the head lies," and giving the signal, he received the stroke with the most perfect composure. Such was the end of the illustrious Sir Walter Raleigh, in the 66th year of his age, by a sentence which was regarded as one of the most dishonourable measures of an odious administration. The panegyrick upon his character by Dr. Campbell is much too highly coloured: Sir Walter Raleigh was not faultless, though in extent of capacity and vigour of mind he had few equals in an age that abounded with great men. His imprisonment was the occasion of his obtaining a high reputation as an author. His writings were on various topics, and are classed as poetical, geographical, political, philosophical, and historical. They are now but little known. His "History of the World," though not much read, is regarded with respect, as one of the best speciments of the English language of that time; the style is pure, nervous, and without pedantry. It is the style of a man of business as well as of a scholar. It has been many times reprinted, but the best edition is that of Oldys, in 1736. He brought down his history no farther than the overthrow of the Macedonian empire. Of his miscellaneous works, a collection in two volumes 8vo. was printed in 1748. Biol. Brit. Hume. Campbell. Cayley.
and parish in the hundred of Rochford, and county of Essex, England, is situated at the distance of 14 miles S.E. by S. from Chelmsford, and 34 miles E. by N. from London. This place appears to have been anciently of considerable note. It was the head of the barony of Swene, and had a castle adjoining to it, of which some fragments and earth-works still remain. These consist of a mount, with an oval-shaped bate, surrounded by a double ditch and rampart, and several outworks, particularly on the east side. The summit of the mount is divided; the western division being of a circular form, and 100 feet high; and the eastern one of an oval form, and lower: the principal ditch varies in width from 36 to 50 feet, and the interior vallum is 50 feet high. The church here is an acent edifice, and contains an old tomb, greatly mutilated, but displaying the remains of very beautiful workmanship in the pointed style. The parson whose memory it was intended to preserve is now unknown; the upper part, to which the inscription was probably affixed, being totally destroyed. The market at Raleigh is held on Saturday, weekly; and there is an annual fair on Trinity Monday. Hearne, in his edition of Leland's Itinerary (vol. iii. p. 8.), informs us that a custom-courthas been kept here, yearly, the Wednesday next after Michaelmas day. "The court," says that author, "is kept in the night, and without light, but as the eye gives, at a little hill without the town, called the King's hill, where the fieward writes out the fines, with coats, and not with inche; and many men and manors of great hold worth of the same; and do sit unto this strange court, where the fieward calls them with as low a voice as possible he may; giving no notice when he goes to the hill to keep the fame court; and he that attends not is deeply aperiod, if the fieward will. "Tis commonly called Lawley-Court." Weaver, in his "Funeral Monuments," adds, respecting this custom, that he was informed, "that this vile attendance was imposed at the first upon certain tenants of divers manors hereabouts, for conspiring in this place, at such an unfeasible time, to raise a commotion." According to the parliamentary returns of 1811, Raleigh parish contains 162 houses, and 1131 inhabitants.

Raleigh, a township of Essex county, in Upper Canada, W. of Harwich, bounded on the N. by the Thames, and S. by lake Erie.

Raleigh, a town of America, in Wake county, North Carolina, the present seat of government, about ten miles from Wake court-house. The general assembly of the state in December 1791, appropriated 10,000l. towards erecting public buildings, and named it after the celebrated sir Walter Raleigh, under whose direction the first settlement in North America was made at Roanoke Isle and in Albemarle Sound. The state-house is a large handsome building, and called Gebäuden. The plan of the town is regular; the streets intersecting each other at right angles. It is, however, subject to the disadvantage of being remote from navigation; 61 miles N.E. of Fayetteville, 167 from Petersburg in Virginia, and 448 S.W. of Philadelphia.

RALEMO, a river of Chili, which runs into the Pacific ocean, S. lat. 37° 56',

RALENDORF, a town of the duchy of Carinthia; 12 miles S. of Sarengen.

RALESTEDE, a town of the duchy of Holstein; 8 miles E. of Hamburg.

RALICOTT, a town of Hindoostan, in Vindapour; 31 miles N. of Amalfagar.

RALENTANDO, Ital., a musical term of late invention, for relaxing the measure at particular parts of a composition, which, when done by a great master, manifests feeling and intelligence; but when attempted by mean performers, it has no other effect upon an audience than that of breaking time; and we think that this refinement is often abused. It has been chiefly practised in France, andfavours of affectation, and that overcharged tenderness which renders the national airs tendres so disagreeable, or fo ridiculous, to the natives of all other countries.

RALLUS, the Rail, in Ornithology, a genus of birds of the order Grallae; the generic character is, that the bill is thickish at the base, attenuated on the back towards the tip, compressed, a little incurved, pointed; the tongue is rough at the tip; the body is compressed; the tail is short; the feet have four cleft toes. There are seventeen species.

*CAEN; land rail, crake, corn crake, daker hen, &c. Of this species the wings are of a rusty red; the bill and legs of a brownish-grey; the irides are of a hazel colour; the feathers of the body are of a reddish-brown; the upper ones are black in the middle; the chin is very pale, and the belly is of a whitish-yellow. It is about nine or ten inches long, and inhabits the sedgy parts of Europe and Asia. From the circumstance of its appearing at the same time with the quail, and frequenting the same places, it has been denominated the king of the quails. Its well-known cry is first heard as soon as the grats becomes long enough to shelter it, and continues till the grats is cut. The bird, however, is seldom seen, as it skulks in the thickest parts of the herbage, and runs so nimbly through it, winding and doubling in every direction, that it is difficult to come near it. When it is hard pushed by the dogs, it sometimes stops short and quats down, by which means its too eager pursuer overthrows the spot and loses the trace. It seldom springs but when driven to extremities, and generally flies with its legs hanging down, but never to a great distance. As soon as it alights, it runs off, and before the Fowler has reached the spot, the bird is at a considerable distance. It emigrates, appearing with us about the latter end of April, and departing in October. On its first appearance, and till the female begins to fit, the male is frequently heard to make a fingular kind of noise, much resembing that of a comb when the finger is drawn along the teeth of it, and which has been used as a decoy. When they first arrive, they are very lean, but before their departure, they become exeeffively fat, and are much sought after for the delicacy of their flesh. They lay from twelve to sixteen eggs in the grats, of a dirty whith colour, with a few yellow spots: the flesh is excellent. There are two varieties, thus described: 1. Rufous brown, beneath paler; wings and tail deeper; the chin and vent are white; the legs are dusky red. This is found in the island of Jamaica. The bill is larger and black. 2. Reddish-grey beneath, and wing-coverts rusty brown. This species inhabits China: the legs are of a dusky colour.

AQUATIC; Water Rail. Wings grey spotted with brown; flanks spotted with white; bill orange beneath, but black and reddish at the base; the irides are red; the feathers of the upper part of the body are of an olive-brown, and black in the middle; the lower ones are cinereous; those of the lower part of the belly and vent are edged with rufous; quill-feathers dusky; the lower tail-coverts are white; the tail-feathers are short and black; the two middle ones at the tip, and the others, are edged with ferruginous; the legs are of a dusky red. It is about twelve inches long, but does not weigh more than four ounces. It is found in the watery places in Europe and Asia. It is sometimes, but not in any
any great numbers, met with in various parts of Great Britain, in low situations, about watercourses and rivulets, where it seeks shelter among fedge, rushes, and reeds, and is seldom put to flight, depending on its legs for safety. When aroused it flies only to small distances, and in a heavy and very awkward manner, with its legs hanging down. It runs nimbly, and frequently flips up its tail. The neck is made of fedge and coarse grals, among the thickest aquatic plants, or in willow beds. The female lays six or more eggs, rather larger than those of a blackbird, of a pure white colour. This bird continues with us all the year, and by many it is erroneously believed to be the land rail metamorphosed in the autumn; but the different bills which the two birds have constitute an essential distinction.

* Porzana; spotted gallinule, or spotted water hen.

This species has the middle tail-feathers edged with white; the bill and legs are of a pale olive. It inhabits Europe and North America, and is generally found on the shores of small streams, hiding itself among the rushes; it is nine inches long. This bird is describably as having a greenish-yellow bill; its irides are hazel, and head brown, spotted with black. The line over the eyes is of a pale grey; the neck above and flanks are of a brown-ash, with small white spots; the back and wing-coverts are olive, with black stripes, and near the edges of the feathers with white spots, the greater with white stripes and lines; the cheeks, chin, and throat, are of a pale grey, with brown spots; the breast is brown, with white spots; the belly is variegated with cinereous and white; the vent is of an ochre-yellow. This bird is extremely timid and sanguine, and is seldom seen in Great Britain, eluding observation by its perpetual vigilance and lurking habits. Its neck is formed, with singular care, of matted rushes, and materials which will float on the water, on which it remains tied, by some filaments, to the flanks of reeds, by which it is prevented from being carried away by the tide or current. The bird is in great esteem for the table.

**Crepitans; Clapper Rallus.** Bill and legs brown; body above olive, the feathers ash at the edges; chin white, throat and breast yellowish-brown. This species inhabits New York, and is from fourteen to sixteen inches long.

* Fuscus; Brown Rallus.*** This is brown, as its specific name imports; its vent is waved with white; the legs are yellow. It inhabits the Philippine isles, and is seven inches long. The body beneath is light chestnut, on the belly it is inclining to grey; the tail is barred with white and black.

**Striatus; Streaked Rallus.** Blackish, waved with white; chin reddish. The bill of this species is of a horn colour; the crown is varied with dusky and bay; the nape is bay; neck, back, shoulders, and rump, brown, with whitish spots; the wing-coverts are marked with a few tranverse whitish streaks; the chin is of a reddish-white; the cheeks, throat, breast, and upper part of the belly, cinereous, with a tinge of olive; the lower part is barred with dusky and white; quill-feathers brown, the outer bands reddish-white, the inner are white; the tail is brown with white lines; the legs are of a greyish-brown. It inhabits the Philippine islands, is eight inches long, and is probably a variety of the philippensis.

**Torquatus; Banded Rallus.** Brown, beneath waved with white; it has a white line below the eyes. This also is found in the Philippine isles, and is twelve inches long. The bill and legs are grey-brown; cheeks and chin black. The body beneath is tranversely streaked with black and white; the collar is of a bay colour; the quill-feathers on the outer edge paler; bands within on the first three white, the next reddish-bay.

**Philippensis; Philippine Rallus.** The specific character of this bird is brown, but beneath it is barred with grey; the eye-brows are white, and the neck beneath has a reddish cast. There are three other varieties, thus described: 1. Red-brown, spotted and streaked with black and white; head chestnut; body beneath and eye-brows cinereous; this, notwithstanding its name, is found at Otaheite. 2. Brown, spotted and streaked with white, beneath white; eye-brows grey; the tail is barred with brown and white; this inhabits Tongataboo. 3. Above brown, beneath ash; back and wings lined with white spots; the belly beneath is white, with blackish bars. This is about eleven inches long, and is found in the Philippine islands.

**Ecaudatus; Tailless Rallus.** Olive; beneath blueish; body tranversely waved with black; eye-brows white. It inhabits Otaheite. The bill is blackish, and the upper part of the head is of a pale brown; the orbits are black; over the eyes, on each side the head, it has a broad white line; the body above is of a deep glossy olive, with a tinge of olive on the shoulders; the vent is of a pale yellow; the tail is so short as to be scarcely perceptible; the coverts are of a pale blue.

**Carolinus; Soree.** This bird is brown; the frontlet is black; the breast is of a lead colour; the bill is yellow; the legs are greenish. It inhabits Virginia, and is from seven to eight inches long; this is a capital bird for the table. The irides of this bird are red; the crown and body above are brown, marked with black spots; the face and chin are black; but the rest of the neck, temples, and breast, are of a blueish-ash; the belly and outer edge of the wings are white; the wings and tail are brown.

**Pheniculus; Red-tailed Rallus.** This species is black but beneath it is white; the bill and legs are greenish; the front is naked and of a flesh colour; the vent and tail of a rufly red. It is found in the island of Ceylon, and is about nine inches long. The bill and legs are tinged with red; the crown and cheeks are pure white; the quill-feathers are spotted with blue. There are two varieties.

**Above cinereous, beneath white; the belly and vent are red.** This is an inhabitant of China, and is fifteen inches long. 2. The front of this is white; the vent is red, and the legs are yellow. It is found in Madagascar, and is longer than the last.

**Virginianus; Virginian Rallus.** Brown, without spots; the bill and legs are brown. It inhabits Virginia, and is probably a variety of the R. aquatilis.

**Ferrugineus; Red-breasted Rallus.** This bird is dusky above, and cinereous beneath; the neck and breast are ferruginous; the bill is pale, and the legs yellow. It is nine inches long; the eye-brows are pale; the flanks are marked with tranverse, narrow, white lines.

**Capeensis; Cape Rallus.** This species is of a ferruginous colour; but the lower part of the breast, belly, vent, wings, and tail, are waved with black and white; the bill is black, and the legs are of a blood-red. It inhabits the Cape of Good Hope and Ceylon, and is of the size of the R. crex. The two middle tail-feathers are ferruginous.

**Ceruleus; Blue-necked Rallus.** This is of a bay colour above, but blueish beneath; the bill and legs are red; the vent is white, and the belly is marked with transverse black streaks. It inhabits the Cape of Good Hope; it is seven and a half inches long.

**Zeylanicus; Ceylon Rallus.** The head of this bird is dusky; the body above is ferruginous, beneath it is reddish, waved with brown; the first quill-feathers are black; the
bill and legs are red. It is found, as its name imports, at Ceylon; it is larger than the R. aquaticus, and has a long tail.

AUSTRALIS; Trogloidyte Rallus. Ruddy ah; wings and tail-brown; the feathers are barred with black. It inhabits New Zealand, and is seventeen inches long. The bill and legs are yellowish; the body above is of a rufly brown, beneath rufly ah; quill and tail-feathers are waved with black.

PACIFICUS; Pacificus Rallus. Black, speckled with white; wings barred; the head is brown, the breast is of a blueish-ah. It is found in Otaheite, and the neighbouring isles. Bill red, the legs are of a flesh colour; the chin and eye-brows are white; the neck of the ruin is rufly.

TABUENSIS; Tabuan Rallus. Brownish-black; beneath it is of a dully colour; the bill is black, and the legs are bay. A variety has its vent streaked with black and white; the legs are red. It inhabits the South-sea islands, and is six inches and a half long. The eye-lids and irides are red.

NIGER; Black Rallus. Black; bill red at the base, brown at the tip; the legs are brown or red. This is an African bird, and is nine inches long.

SANDECUENCIS; Sandwich Rallus. This is of a pale ferruginous colour; but the bill is of a dusky ah; the legs are of a dull flesh colour. A variety has a yellowish bill and legs. It inhabits the Sandwich isles; and another variety is very small, and found in the Tanna isles.

TAITIENSIS; Otaheite Rallus. Cineous; body above red-brown; the bill, rounded tail, and claws, are black. This inhabits Otaheite and the Friendly isles, and is about six inches long. The quill-feathers are dusky and edged with white; the legs are yellow.

OCCIDENTALIS; Dusky Rallus. This is brown streaked with black, beneath it is of a rufly brown; the bill is black, and the legs are of a red-brown. It inhabits the Sandwich isles, and is six inches long; the edge of the mandibles is yellowish.

LONGIROSTRIS; Long-billed Rallus. The upper part of this species is cinereous, spotted with brown, beneath it is rufly white; the flanks are transversely waved with white, the bill is long and of a ferruginous colour. It inhabits Cayenne, and is from nine to twelve inches long. The bill is tipt with brown; the legs are yellowish, and the chin whitish.

VARIEGATUS; Variegated Rallus. This bird is streaked and spotted with white and black; the hind-head is dusky; the bill is yellowish; the chin is white; and the legs are yellow. It inhabits Cayenne, and is eleven inches long. The wings are brown, the covert is spotted with white; some of the middle tail-feathers are edged with white.

CAVENNNIS; Cayenne Rallus. The crown of this bird is rufous; the body above is of an olive-brown; beneath it is rufous; the ocular hand is blackish; the quill-feathers are black; the bill is brown, and the legs bay. There is a variety having its crown bay; chin and vent reddish-white. It inhabits Cayenne and Guiana; it is eight inches long; in the evening it is noisy and gregarious, by day it is solitary; it builds in the forkt branch of a shrub, near the ground. The vent is pale.

JAMAICENSIS; Jamaica Rallus. Above reddish-brown with black streaks; the bill and chin are black; the throat and breast are of a blueish-ah; the belly is marked with white and brown lines. It, in its name imports, inhabits Jamaica, and is five inches long. The bill is reddish at the base; wing-coverts brown, spotted with white; the quill-feathers are of a reddish-brown, with black lines, the secondaries and tail-feathers are spotted with white, and the legs brown.

MITRUS; the Little Rallus. This is brown, but beneath it is yellowish; eye-brows, streaks on the back, and spots on the wing-coverts, white; tail barred black and white. A variety has the middle of the neck above rufous; the belly and vent are waved with black and white. It inhabits Cayenne and Jamaica, and is five inches long. The bill is brown; the wing-coverts are black; the chin is whitish, and the legs are yellow.

PUILLUS; Dwarf Rallus. Striped with ferruginous and black; the body beneath is blackish, with narrow white bands; the throat and breast are blueish. This is found near salt lakes of Dauria, and is of the size of a lark. The face, neck beneath, and middle of the breast longitudinally, are blueish; the middle of the chin is whitish; the longitudinal band through the eyes of a pale rufly colour; the back is scattered with white longitudinal lines; the legs are greenish.

BARBARICUS; Barbary Rallus. This is of a ferruginous colour; the bill is black; the wings are spotted with white; the rump is streaked above with white and black, and beneath with white; the legs are of a dusky brown. This, as its name imports, is an inhabitant of Barbary, and is the size of a plover.

DUBUS; Doubtful Rallus. Striped with brown and ferruginous; the belly is white; the flanks are barred with brown and rufly ah; the first quill-feathers without are longitudinally white. It is the size of the common gallinule. The face is of a pale rufly colour; the chin is of a dirty white, surounded with a broad brown collar; the fides are brown; the bill and legs greenish-black.

RALLYING, or War, the reassembling, or calling together of troops, being confuted, and put to flight.

RALPH, James, in Biography, a miscellaneous writer, defended probably from mean parentage, was the intimate friend of Dr. Franklin, who speaks of him as ingenious and shrewd, gented in his address, and extremely eloquent. Franklin knew him in America, and though he does not mention what Ralph's situation then was, yet as he wrote a fine hand, and was well versed in accounts, it is imagined he was a schoolmaster. In 1725 Ralph accompanied Franklin to England, with a resolution of not returning to America, where he left his wife, with whom, and with whose family, he had lived on ill terms. In London he was, for a considerable time, supported by his friend Franklin, till their intimacy was dissolved, when Ralph considered the quarrel as a complete discharge of the debt which he owed his benefactor. Ralph changed his name to that of Franklin, which he thought necessary, having formed a new female connexion, and settled as a schoolmaster in a village in Berkshire. From this time there is no regular narrative of his life, which was probably passed as a hired party writer. He is spoken of with much-contempt in the Dun-grad, as the author of a poem called Night: —

"Silence, ye wolves! while Ralph to Cynthia howls, And makes night hideous—Anfwer him, ye owls."

In a note, it is said he wrote a fawing piece, entitled "Sawney," very abusive of Swift, Gay, and Pope; that he panegyrised his own works in the journals, was wholly illiterate, wrote plays, and was employed in a political newspaper. The late Pope must be taken with much limitation, it being inspired by party motives: Ralph having recommended himself to persons in power at the beginning of George II.'s reign, would for that reason be obnoxious to Pope and his friends. He became an able writer.
RAM

writer in prose, and was author of many political pamphlets, which were much applauded in their time; but his chief work was "The History of England during the Reigns of William, Anne, and George I.," with an introductory Review of the Reigns of the Brothers Charles II. and James II., in which are to be found the Seeds of the Revolution. By a Lover of Truth and Liberty," 2 vols. fol. 1774—6. This work obtained the plaudits of Mr. Fox, who, in his posthumous historical fragment, speaks of the author as "the historian of great acuteness as well as diligence. The last publication of this author was entitled "The Cate of Authors by Profeffion or Trade, stated with regard to Booksellers, the Stage, and the Public," which is laid to contain much good sense and lively fatire. Mr. Ralph died at Chiswick, in the year 1762. Gen. Biog.

RAM, in Geography, a town of European Turkey, in Servia, on the S. side of the Danube; 10 miles E. of Paffarowitz.

RAM, in Agriculture, the male of the sheep kind. It may be observed, that the rams of different breeds of sheep vary greatly in their forms, woods, and fleeces, and other properties; but the following description by that excellent flock-farmer, Mr. Culley, defcures the attention of the breeder and grazier. According to him, his head should be fine and small, his nostrils wide and expanded, his eyes prominent, and rather bold or daring, ears thin, his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which mutt at the same time join so easy to the collar forward, and chine backward, as to leave not the leaf hollow in either place; the mutton upon his arm or fore-thigh must come quite to the knee; his legs upright, with a clean fine bone, being equally clear from superfluouf skin and coarse hairy wool from the knee and hough downwards; the breast broad and well forward, which will keep his fore-legs at a proper widenefs; his girth or cleft full and deep, and in- stead of a hollow behind the shoulders, that part by some called the fore-fflank should be quite full; the back and loins broad, flat, and straight, from which the rum-mand rife with a fine circular arch; his belly straight, the quarters long and full, with the mutton quite down to the hough, which should neither fland in nor out; his twill, or junction of the infide of the thighs, deep, wide, and full, which, with the broad breast, will keep his fore-legs open and upright; the whole body covered with a thin pelt, and that with fine, bright, loof wool. It is observed, that the nearer any breed of sheep comes up to the above defcription, the nearer they approach towards excellence of form.

But though this is a very correct, appropriate, and admir-able description of a finely-formed ram, objections have been made by fome to a few of the properties which are laid down. Width and expansion of the nostrils in sheep, it is suppos'd, are liable to caufe the lower parts of the nofes to be too thick and large; while in naturally good and improved forms, the lower parts of the nofes and mouths are for the most part small. Nor is the pro- minent and bold daring eye held in more estimation, as it is thought not to fiew a good difposition; but, on the contrary, to displa'y too much quicknefs and activity, or wildnefs of nature in the animal. Opinions, however, differ much on this point among sheep-farmers; and a lively quick eye is almoft always considered as favourable to a good difposition.

Rams naturally poifefs more boldnefs and courage than either wethers or ewes; and they are very apt, unless great care is taken, to acquire mischievous habits of attack- ing perfo ns or animals that may by accident approach them.

In some sheep-diftrics the breeders are greatly in favour of large rams, but in others fome of a fmalier fize are prefer-red; the choice of the fize of the rams fhould, however, in every inftance, be regulated by the nature and abundance of the keep, or the quality of the lands, as it is utterly im- poifible that the inferior forts of pastures can keep sheep flock of the large fize, as in thole of the better kinds; and it would be highly disadvantageous in the beft riche forts to have a small-sized flock when they could support a large one in an equally perfect manner. Middle-sized rams are, upon the whole, the moft fuitable and proper for lands in general, and for all the purpofe of the breeder.

The growth and conftitutions of young rams should never be fuffered to be endangered by their having too great a number of ewes, as is too frequently the practice with sheep-breeders.

It is a very improper custom, but one which prevails with the graziers in fome sheep-diftrics, to keep all their rams, perhaps to the amount of from twenty to fifty or more of all kinds, in one field or pature; as their contentions are often fo violent, especially about the riding time, as to caufe the fols of one or two rams to each in all fuch cafes. This practice is the moft common in the sheep-diftricts to- wards the southern part of the island, being feldom met with in thole of the midland or more northern parts. It ought to be every where done away with.

The old rams are now almoft always got quit of by being fattened as rams, and fold at the neighboring markets, or to butchers, at a very inferior price, there being often much competition for this fort of low-priced meat in fome situations. It was formerly, however, the custom in fome places to knit them before they were fattened and fold to the butchers or otherways, but much injury and lots being found to be foltrained by that method, it has been left off; it being now concluded, on the whole, that the lots by knitting the rams is greater than that which is fuffered in the re- duction of the price of ram mutton.

The practice of letting out rams in the midland diftricts for the purpose of improving the breeds of sheep, having produced fuch beneficial effects, the rife, nature, and pro- grefs of it may deferve the attention of the flock-farmer. It has been ably and accurately delineated, in the following manner, by Mr. Marlhall, in his Rural Economy of that part of the kingdom.

It is flated, that in this diftrict, in general, the manage- ment respecting rams is fimilar to that of other parts of the island; the breeders rearing or purchafing them. But that it is observa ble, however, that the advocates of the old breeds, though they will not adopt the modern flock, have fallen, in some degree, into the modern practice of letting by the fefon. But that the rams of the modern breed are never fold; but are palled from breeder to breeder, by the fefon only. And that for the purpose of promoting this inter- course, each principal breeder has his float of rams; commencing, by common confeft, the 8th of June, and lafiting until Michaelmas, or until the fefon of letting be palled. That during a few weeks after the shows commences, every ram-breeder may be faid to keep open house. Breeders and others, from all quarters of the kingdom, as well as the promoters of the breed who reside in the neighbourhood, attend these shows; going, in parties, from one to another; fome to take, others to fee and pafs their judgment. And that these private exhibitions clofe with a public show, at Leicester, the roth of October; when rams of every defcription, but moftly an inferior fort of the improved
proved breed, are collected; being brought in wagons; many of them from a considerable distance; some to be field, but chiefly to be let for the season. That this show has been held, he believes, time immemorial; not, however, for the purpose of letting, but for that of sale. But the letting of rams by the season, has long, he understands, been a practice in Lincolnshire. However, the origin, in the midland districts, may be traced—to a ram let by Mr. Bakewell, at Leicester fair, about forty years ago, at the low price of sixteen shillings. But humble, however, as was this beginning, it proved, Mr. Marshall says, to be the first stone of the foundation of a department of rural busines, that has already risen to an astonishing height, and may, for some length of time, continue to bring in a copious source of wealth to the country. In the management of this busine, the principal ram-breeder fave annually, twenty, thirty, or perhaps forty ram-lambs; castration being seldom applied, in the first instance, to the produce of a valuable ram. For, in the choice of these lambs, they are led more by blood, or parentage, than by form; on which, at an early age, little dependance can be placed. He adds, that their treatment, from the time they are weaned, in July or August, until the time of shearing, the first week in June, confonts in giving them every indulgence of keep; in order to push them forward for the show: it being the common practice to let such as are fit to be let the first season, while they are yet yearlings—provincially fiarhogs. Their first pasturage, after weaning, is pretty generally, he believes, clover that has been mown early, and has got a second time into head: the heads of clover being confidered as a most forcing food for sheep. After this goes off, turnips, cabbages, colewort, with hay, and report fays, with corn. But the use of this the breeders feverally deny, though, collectively, they may be liable to the charge. However this may be, something confiderable depends on the art of making up—not lambs only, but rams of all ages. Fat, like charity, covers a multitude of faults; and, beside, is the bell evidence their owners can produce, of their fattig quality, —their natural propensity to a state of fatness; while in the fates of the fiarhogs is feen their degree of inclination to fat at an early age. And that the fattig quality being the one thing needed in grazing flocks, and being found, in some confiderable degree at birth, to be hereditary,—the fatter rams are of course the left; though other attachments, well or ill placed, as to form, or fashionable points, will perhaps have equal or greater weight in the minds of some men, even in this enlightened age and diftrict. And the shearings, which will not make up sufficiently, as to form and fatness, are either kept on to another year, to give them a fair chance, or are castrated, or butchered, while fiarhogs.

With regard to the flowing, it is remarked, that the shows of the principal breeders confift, by common confent, of forty rams each, moftly from one to five years old, they being seldom found efficient after that age; some, however, will continue in vigour to the fifth or seventh year. And that, during the show, they are moftly kept in small inclosures, of two, three, or four acres; with three, four, or more rams in each, according to their ages, and the advancement of the fason. And in a corner, or other convenient part of each paddock, a small pen, made with hurdles, is placed; for the purpose of handling them. Into these pens they go, through custom, as tractably as worked oxen to their stalls. Indeed, the old rams, from the unwieldines of their frame, and the load of fat they have to carry at this fason, as well as from habit, will suffer themselves to be handled abroad; and even appear to take pleasure in the respect with which they have been treated. But it is observed, that of late a new method of flowing has been tried out by the leading breeder, and adopted by one at least of his followers. Instead of flowing them abroad, and driving three or four of them up together in a pen, they are shut up in bowls, and brought out separately, being never seen together. He thinks, that among accurate judges, this mode of flowing may be well enough; but to those who have had less experience it gives offence, as it deprives them of their best guide, comparison; and he can see no fair advantage accruing from it to the latter.

It is remarked, that though the defirable points of a ram are such as have been noticed, the choice of the hirer is determined, in some measure, by the intention for which he is about to hire: as whether it be that of getting wedders, or mere grazing flock: or rams for the purpose of letting. Hence the grazier and the ram-breeder choose different sheep, so as to suit their different purposes. He adds, that the characteristic difference between what is termed a ram-getter, and a wedder-getter, or a good grazier’s sheep, is that of the former being every where cleaner and finer, the head small, the bone and offal light, the flesh good, and the form beautiful. The mere grazier likes a ram no worse for having a strength of frame, and is less scrupulous about his form than the ram-breeder, whose great object is fineness: his ewes, and the natural tendency of the breed, serve to give his offspring size and substance when it is wanted.

In respect to the practice of letting, it is observed, that a novel circumstance has likewise taken place lately in the busines of letting. The traditional custom of letting a price was exploded, at least by the late Mr. Bakewell, and one of his disciples; whose customers were left to make their own valuations, and bid what they pleased. But this, as well as flowing them separately, it is observed, gives great offence, especially to strangers, who cannot brook the idea of being both buyers and sellers. The latter, however, has more than one advantage in referring the price, provided he do not thereby drive away his customers: he is, in effect, letting to the best bidder.Besides, he is, through this means, enabled to regulate his prices to his customers, without giving any of them pointed offence: for as the principal breeders are, in the main, of their busines, competitors, it is no more than common good policy, in the leader at least, to advance himself, and keep back those who press upon him closely. It is, therefore, good management, Mr. Marshall thinks, in him to let a superior ram to an inferior breeder, whose ewes are yet of bafe blood, at a lower price than to one who is farther advanced, and whose ewes perhaps are nearly equal to his own: for if the hirer may not thereby be able to get the lead from him, he may run away with part of the best prices; and the only line the leader has to tread is, either to refuse him, or to make him pay in the first instance. And again: sometimes two or three capital breeders will join in the hiring of one superior ram; and, in this case, the blood being more widely dispersed, the price ought to be, and always is advanced, in proportion to the number of partners there may be in the busines. Hence, in the leader, a refervation of price may be allowable, especially in the letting of first-rate rams.

He observes, in regard to the conditions of letting, that notwithstanding the number of years the letting of rams has now been in use, and the extraordinary height to which the prices have risen, the transaction does not appear to have yet received any settled form; nor to have been rendered legally binding, by any written articles, or conditions of letting; much being still left to the bonour of the parties. It is, however, generally understood, that the price agreed upon...
RAM.

upon shall not be paid, unless the ram in contract, or another as good, impregnate the stipulated number of ewes. If, through accident or inability, part only be impregnated, a proportional part of the price is abated. If he die while at ride, the los falls on the latter, whether his death happens through accident or neglect; no cates, he understands, having yet been otherwise determined. It is likewise under- flood, that the herdsman shall not suffer him to serve any other than his own ewes; and of these, no more than a stipulated number, which is proportioned to the age or ability of the ram, and the mode of using him. And further, that if a grazier hire a valuable ram, at a wedder-getter's price, (which is not unusual at the wane of a season, when valuable rams happen to be unlet,) it is under-flood, or rather agreed, that he shall not fear rams from him; a condition which may frequently be advantageous to both parties. The letter pockets five or ten guineas, which otherwise he might not have had; and the herdsman, by suffering himself to be "tied down," as it is termed, gets a greater improvement in his stock than otherwise he could have got for the same money. He adds, that the time of paying the money is, he understands, unfixed; feldom, he believes, until after the ewes have brought proofs of the ram's efficiency, or after the lambing season.

It is observed, that with regard to the prices for letting rams by the season, that from the first letting to the year 1780, the prices kept gradually rising from sixteen shillings to a guinea, and from one guinea to ten. In 1780, Mr. Bakewell let several at ten guineas each; and what is rather inexplicable, Mr. Parkin of Quarendon let one, the same year, for twenty-five guineas, a price which then astonished the whole country. That from that time to 1786, Mr. Bakewell's stock rose rapidly, from ten to a hundred guineas; and that year he let two-thirds of one ram (referring one-third of the usual number of ewes to himself) to two principal breeders, for an hundred guineas each; the entire services of the ram being rated at three hundred guineas. This excellent breeder making that year, by letting twenty rams only, more than a thousand pounds! and that, since that time, the prices have been still rising. Four hundred guineas have been repeatedly given. The above breeder, this year (1789), makes, he understands, twelve hundred guineas by three rams, (brothers he believes,) two thousand of seven, and of his whole letting full three thousand guineas! And that he now lets nothing under twenty guineas; a well-judged regulation, which Mr. Marshall thinks will probably be beneficial both to himself and his customers.

It is added, that, beside this extraordinary sum made by Mr. Bakewell, there are fix or seven other breeders who make from five hundred to a thousand guineas each. The whole amount of monies produced this year, in the midland counties, by letting rams of the modern breed for one season only, is estimated, by those who are adequate to the subject, Mr. Marshall thinks, at the almost incredible sum of ten thousand pounds. He knows that it is a popular idea, especially of those who, living at a distance, have only heard of these extraordinary things, without having an opportunity of coming at facts, that the extravagant prices which are talked of are merely nominal; the principal part of the money being returned, the actual prices given being small, in proportion to those held out. This, however, is, he believes, and on the best authority, an erroneous idea. At the first setting out of the high prices, there might be some transfigurations of that nature; but if ever they existed, they have ceased long ago. Mr. Bakewell at present has the name, at least, of being parimonious, even to the shepherds of the flocks on which his rams are employed. His highest present, he understands, is five shillings; if the price be under fifty guineas, only half-a-crown. But the enormousness of these prices may be explained, he thinks, on other grounds. The high prices are not given, he says, by graziers, for the purpose of getting wedders as grazing flock; but by ram-breeders, for the purpose of getting rams, to be let to graziers; the highest being given by the principal breeders only, not for the purpose of getting rams to let to graziers as wedder-getters, but for that of getting rams, to be let out again to inferior tup-men, as ram-getters.

It is further stated, that the graziers' prices run, even now, from one to ten guineas. He has not heard of more than ten guineas being given, by a mere grazier, for a ram, for the sole purpose of getting grazing flock: five or six guineas is the common price. And supposing he gives the highest price, ten guineas, and that the ram serves a hundred ewes, (some single, some double,) the expense of getting amounts to no more than two shillings a head; which is incomparable, compared with the difference between a well and an ill grazing sheep, between a sheep that will get as fat at two years old as another will at three; or, in other words, which will, at two years and a half old, fetch ten or fifteen shillings more than his comrades of another breed, but of the same natural size, and going in the same partures, or feeding on the same sort of food. In respect to the middle prices, as those from twenty to fifty guineas, they are, under the present circumstances, equally reconcilable, he thinks, to common sense. If a breeder, who gives fifty guineas, rear ten tolerable rams fit for the grazier's use, and let them at five guineas each, he brings himself home, even the first season of letting, besides having the rams fit for another season and another flock, and besides a general improvement in his stock for the future. And those who give the higher prices, as one to two hundred guineas, have, or ought to have, proper bales to build upon, sufficient flocks of well-bred ewes; in which case, they have a fair chance of producing ram-getters, worth, while the present spirit of improvement lasts, twenty to fifty guineas a season. And that with respect to the very high prices, they are given by a few first-rate breeders, who are playing a high game, running a hard race, for the pride and profit of being a leader, when Mr. Bakewell is not; a contention which may last as long as Mr. Bakewell, and be at once an honour to his genius, and a reward of his services.

In respect to the treatment of rams after letting, it is remarked that the breeders of rams, as well as of bulls, find it expedient to reduce them to the eumorphous state in which they are shown, previously to the season of employment; the old rams, in particular, being frequently returned upon their hand, non-efficient. Hence, as they are let, they are transferred to private partures, and moderate keep; it being a pretty general rule not to show a ram after he is let, or contracted for to a person.

In the feeding out on let rams, the usual time of beginning is the middle of September: the means of conveyance, carriages of two wheels with springs, or hung in sholts; some of them being large enough to hold four rams. In these they travel from twenty to thirty miles a day; being sometimes sent, in this way, two or three hundred miles, and sometimes more.

It has been observed by the same writer, that the manner of using these rams has lately received a very great improvement. Instead of turning them loose among the ewes at large, as heretofore, and agreeably to the universal practice of the island, they are kept apart, in a separate paddock or small
small inclosure, with a couple of ewes only each, to make them roll quietly; having the ewes of the flock brought to them singly, and leaping each only once. He thinks, by this judicious and accurate regulation, a ram is enabled to impregnate near twice the number of ewes he would do, if turned loose among them, especially a young ram. And he adds, that, in the old practice, fifty or eighty ewes were esteemed the full number for a ram; in the new, from a hundred to a hundred and twenty are allowed. Seven score have been served by one ram in a season: this, however, much too great a number.

And while at ride, the treatment of the ram is merely that of keeping him well, and free from disorders; suffering him to serve no other than the hirer's own ewes, and of these the limited number only, and to return him safe when he has done; generally the beginning of December: or, if the hirer has met him on the road, (which is customary,) the latter, in return, meets him on his journey home. And the after treatment consists in stirring, by every devious means, to reload his carcase, and make him fat and handsome for the ensuing show, in order that he may be let again with advantage.

This is the whole of the plan that was pursued in that district, which has led the way to so much improvement in the breeding of sheep, and from which the country has derived such vast benefits, and such a number of advantages. But though the above practices have not been lately carried on to their former extent, they are still very considerable. See Sheep.

It is remarked, that the practice of hiring rams in Romney Marsh is not carried on with the same degree of spirit as it is in Leicestershire, and that rams were of more value for the hiring feason some time ago than they are at present, especially when the crofs of the above county took place, as then from twenty to one hundred guineas were frequently given. One graizer some time since let rams to the amount of twelve hundred guineas; but the rage is now over, the people not being so foolish as to be duped out of their money, without the prospect of being repaid. It is here the practice with some to ride their ram lambs; but they are paid always to be injured in their growth, if not in their constitutions and dispositions, by it. When a ram dies while at ride, the losfs falls on the owner, and, before, he is not paid for the riding. The time of paying is when the rams are removed from the ewes. This is done by carrying them away in carts, or leading them by ropes. The ram lambs are here now mostly selected and fattened, in such numbers as are proper for the hirers.

Some time before the riding season, the graizers call and agree for the hiring or purchasing of rams, the general price usually from three to five guineas; but a superior one will bring ten in particular cases, though many good useful ones let at three guineas. Some purchase them to ride, and immediately afterwards sell them in the markets. The rams, which are to be hired, are here flown all together in pasture fields, which is a disadvantagous method.

In Suffolk, until lately, ten guineas were the highest price that was heard of for the sale of any ram. Now some let many of their three-years old rams for fifty; and inferior ones at thirty, twenty, and ten guineas. Some have even been let to high as one hundred guineas.

RAM is also a term used to signify any thing which has a strong smell or taint.

RAM, in Astronomy. See Aries.

RAM of M. Montgolfier, Hydraulics, in Mechanic, a machine for raising water to any given height, which has lately attracted much attention in France. The first person who employed this method was Mr. Whitehurst, and it was afterwards improved by Mr. Boulton. Its construction and use may be sufficiently understood by the following statement. It serves to raise water by means of the momentum of a stream of water flowing through a long pipe. The passage of the pipe being flopped by a valve, which is raised by means of a bar, as soon as the water begins to move sufficiently, the whole column of fluid must necessarily concentre its action almost instantaneously on the valve, and in this manner it leaves the characteristic property of the water, and acts as if it were a single solid; so that, supposing the pipe to be perfectly elastic and inextensible, the impulsive motion overcome any prejudice, however great, that might be opposed to it; and if the valve open into a pipe leading to an air-receptacle, a certain quantity of the water will be forced in, so as to condense the air, more or less, rapidly, to the degree that may be required, for raising a portion of the water contained in it to any given height. Young's Course of Lectures on Nat. Philos. vol. i.

RAM, in Mythology, the name of the highest god among the Gentoos. When a widow offered herself to be burnt on the funeral pile of her husband, she was encouraged by the presence of a number of attendants, who formed a circle around her, and offered her fresh betel, entreating that, as she would in a short time appear with her husband in the presence of Ram, or their highest god, she would supplicate for various favours for them; and above all, that she would salute their decafe friends, whom she might meet in the celestial abodes, in their names.

RAM, Battering. See Aries.

RAM's Horns, in Fortification, a name given by M. Belidor to the tenailles.

RAM-Head, on board a Ship, the name of a great block belonging to the fore and main halliards. It hath in it three shivers, into which the halliards are put, and at its head the eyes are reeved into a hole made there for that purpose.

RAM-Head, in Geography, a cape on the S. coast of Ireland, and county of Waterford; four miles E. of Youghal bay. N. lat. 51° 50'. W. long. 7° 44'.—Alfo, a cape on the S. E. coast of New Holland. S. lat. 36° 56'. E. long. 119° 35'.—Alfo, a cape of England, on the S. coast of Cornwall, in the English Channel, between Whitehead bay and Plymouth found. N. lat. 50° 19'. W. long. 4° 2'.

RAM-Hornuz, a town of Persia, in Chufitan; 65 miles S.E. of Susser or Shuffer.—Alfo, one of the most romantic valleys in Persia, which has been lately placed under the beglerbeg of Behaban. It is fifteen furlongs in length (the furlung being estimated at 32 English miles), and from six to eight miles in breadth. The river Jeraci, entering at the eafen extremity, eows through the centre of it, when meeting the Kkoorkhankeende, which descends from the mountains five miles E. of the town of Ram-Hornuz, they together force a passage through a low ridge of hills, which skirt the valley to the fourth. This fertile spot is, at present, in the hands of five native chief's; the firft of whom is an Arab, who resides in a mean village, situated at the W. end of the valley, and built amidst the ruins of the ancient city of Ram-Hornuz. The remaining four are Persians, and brothers, who have each a castle, or fortified village; from which they make frequent raids, and carry off the corn of cattle of their rivals. A great battle was fought in this valley, between Artaxerxes Babegan, and Ahabanes, in which the former was victorious, and first aliumed the title of "Shah en Shah," or king of kings. Kinneir's Peri. Emp. 1813.

RAM's Island, an Island in lough Neagh, Ireland, about two miles from the shore, and containing about six acres.
acres. It is in the western part of the lough, in what is called Sandy bay, and is the only island. One of the round towers, so frequent in Ireland, is found here, and renders it an interesting object from the neighbouring grounds. Dubourdieu's Antrim.

RAM or RAMLA, a town of Palestine, which was formerly large, and defended with strong walls; celebrated as the place where St. Paul cured Æneas. The Mussulman reverence here the tomb of Locman the wife, and the sepulchres of seventy prophets, said to have been buried here. The church of St. George is the only object now worthy of notice. The place has a kind of market for gall-nuts, fena, and gum arabic, which the Arabs bring hither for sale; 20 miles N.W. of Jerusalem.

Rama, a town of Dalmatia; 20 miles S.W. of Moitar.

Rama, or Ramab, signifying an eminence, in Scripture Geography, a town of Judea, in the tribe of Benjamin, according to the book of Joshua, ch. xviii. v. 20. It was situated towards the mountain of Ephraim, between Gaba and Babel, about seven miles from Jerusalem, according to St. Jerom. This city lay on the road from Samaria to Jerusalem; for which reason Baasha, king of Israel, caused it to be fortified, to obstruct the passage from the land of Judah into that of Israel. This is the Ramatha, or Ramathaim-Zophim, the country of the prophet Samuel. (1 Sam. i. 19. and ii. 11. &c.) It was on the frontiers of Ephraim and Benjamin; and frontier cities were inhabited by both tribes. Jeremiah probably speaks of this Ramah. Jer. xi. 1, 2, 3. See also ch. xxxi. 15, 16, 17.

Rama, a city of Naphthali (Josh. xix. 35.), on the frontier of Apher (Josh. xix. 20.)

Rama, in Hindo Mythology, is the name of a distinguished mortal, in whom their deity Vishnu was incarnated for the purpose of relieving mankind from the tyranny and oppression of Ravana, the malignant king of Lanka, or Ceylon. This incarnation is one of the ten avatars, or defences of Vishnu, and is, in its supposed importance, second only to that of Krishna. It is similarly a popular history, and allusive to it perpetually occurs in the writings and conversation of the Hindoos. The invasion and conquest of Lanka is the subject of one of their finest poems, entitled the Ramayana; it furnishes subjects for the drama, for itinerant bards; and for every purpose of poetry, being replete with magnificent imagery, and abounding in striking incidents. (See Ramayana.) The mortal parents of this divine hero were Raja Dafaratha, king of Ayodisha (Oude), and his first wife Kahunislya. Hence this Rama is sometimes styled Dafar Rama, to distinguish him from other heroic Ramas; and sometimes Rama Chandra, meaning of lunar descent.

There are three persons of the name of Rama, recorded as incarnations of Vishnu. One is Bala Rama, the elder brother, by the same parents, of Krishna; the second, Para Rama; and the third, Rama Chandra, the subject more immediately of this article. But it has been made a question, whether they be not three representations of one person, or three different ways of relating the same history; and whether any or all of them mean Rama the son of Cushi, for W. Jones (A. Ref. vol. i.) says he leaves others to determine. He deems Rama to be the same as the Grecian Dionysos, who is said to have conquered India with an army of fayrs, commanded by Pan; and Rama was also a mighty conqueror, and had an army of large monkeys or fayrs, commanded by Maruty, son of Pavan. (See Maruty.) Rama is also found, in other points, to resemble the Indian Bucephus: he is, notwithstanding his lunar appellation above noticed, fabled to be a descendant of the sun, his wife's name is Sita; and it is very remarkable that the Peruvians, whose Incas boasted of the same descent, riled their great festival Ramasoa.

In a charge delivered by Dr. Watson, afterwards bishop of Landaff, to the clergy of the archdeaconry of Ely in May 1780, are many curious and shrewd observations on oriental usages. He notices a "string of curts deeply with the same amongst people so far removed from each other as the Egyptians and Peruvians. The Egyptian women, be fays, made sacred cakes of flour, which they offered to the queen of heaven, at their principal solar festivals called Raymni and Ctinna: the Peruvian women did the same." Almost all the customs described as common to these diflant people, the Egyptians and Peruvians, as well as that quoted, are Hindoo curts, ancient and existing.

All the Ramas are famed as great warriors and as youths of perfect beauty. In the Gita, an epic of the Mahabarat, Krishna, describing himself to Arjun as pre-eminent among all things and persons, says, "Among those who carry arms, I am Rama." It is Rama Chandra, however, and his lovely Sita, who are the favourite subjects of heroic and amatory poetists: he is described in the Ramayana of ample shoulders; brawny arms, extending to the knee; neck shell-formed; chest circular and full, with auspicious marks; body hyacinthine; with eyes and lips of fangine hue; the lord of the world; a moiety of Vishnu himself; the source of joy to Ikhwakwus's race." He is suitably mated in his faithful Sita, one of the most interesting females in Hindoo poetry. (See under her name for some account of her, and a description of her person.) Rama is also called Raghub, or son of Raghu, (see these articles,) like Ikhwaku, one of his mortal ancestry. Kaka-paksha-dara, or crow-winged, is an epithet given to the Ramas, and to other warriors, from a certain mode of holding the head, leaving the hair over the ears only, rendering crow's wings, as is fancied. Shyamula, or blue-bodied, is an appellation of Rama, as well as of Krishna, and of their common prototype, Vishnu; all being represented of hyacinthine hue. It may be here remarked, that several incidents in the Sri-Bhagavat, (a history of Krishna,) and in the Ramayana, told similarly of their several heroes, seem to mix or approximate, though perhaps scarcely to identify, the characters of Krishna and Rama. Each was a wife by bending an unyielding bow; not very unlike the story of Ulysses. Each is described as over-coming the demon, Kumbakarna, and others. Krishna descended into hell; so did Sita, the fakti, or energy of Rama. Both have adventures with the bear Jamba. See Jamba, &c.

All sects and tribes, who, under the denomination of Vaijnavas (which see,) worship Vishnu, (bating such deistical philosophers as sceptically deny the personal existence of inferior deities, attributes, or avatars, of whom fee under JAINA,) agree in placing, that, with the exception of Krishna, the potentiality of the preferring power was never exhibited in such plenteous as in the avatara of Rama. In popularity, and in dramatic, historico, and poetic shapes, it rivals that of Krishna. And as one or more feasts adore Krishna as the deity himself, and draw rules for their religious and moral conduct from the Sri-Bhagavat; so the feast called Ramany similarly clothe Rama in almighty attributes, and deem the Ramayana a complete body of ethics and morality. See RAMANY.

In the series of incarnations of Vishnu, called das-avatars, or the ten defences, to distinguish them from others of less importance, the avatars of Para Rama and Rama Chandra are usually placed sixth and seventh, as given under VISINU. Sometimes Krishna is altogether omitted; in which case,
Bala Rama ranks as the eighth. Muyala is a name of the third Rama, under which word some notice is taken of him. And of Parufes or Paruflha Rama, see under that article. The name of Rama, or perhaps more correctly of Rami, is one of the many names of Parvati, conort of Siva. The name is also used, beyond the pale of his own sectaries, in supplication and praise. Ram-Ram is a usual salutation, like our good morrow, between friends at meeting or parting, and is used by both Vaishnavas and Saivas; and it is reverently reiterated in times, and in aid, of ablation (see JAP); and under the operation of feelings of enthusiasm or diffidence.

The history of the Ramas mixes itself with that of so many others of Hindoo mythological personages, that in many of our accounts of such personages, &c. particulars occur respecting them. Thole deifics of further notice of the Ramas are, therefore, referred, in addition, to the following articles: Ceylon, Jaya, Rajahnslya, Lakhinmax, Lanka, Maruty, Ravena, Ramayana, Ruseka, Sita, &c. from which other references point to articles on subjects connected herewith.

RAMADA, or Nem Salamanca, in Geography, a town of South America, in the province of St. Martha; 90 miles E. of St. Martha. N. lat. 11° 10'. W. long. 72° 20'.

RAMADAN, a port of bent observed by the Mahometans, in obedience to the express command of the Koran, during which they fast the whole day, from the time the new moon first appears, till the appearance of the next new moon, with such extreme superition, that they not only abstain from eating, drinking, &c. but, dare not wash their mouth, nor even swallow their spittle, from day-break till night, or sun-set.

The men, indeed, are allowed to bathe themselves; but it is on condition they do not plunge the head under water, lest some drops enter by the mouth or ears, &c. But as for the women they are strictly forbidden bathing. Some are so cautious, that they will not open their mouth, to speak, lest they should breathe the air too freely. The fast is also deemed void if they kiss or touch a woman. To make amends, they feast all night till day-break; though the more rigid begin the feast again at midnight; and usually spend more in this month than in six others.

The Ramadan happens at different seasons of the year; and when it is in the summer it is very hard on the labourers. This month once in thirty-three years is in every feast of the year, the Turkish month being lunar, and they beginning at the day they can see the moon; whereas the Jews begin their account from the day the moon makes, which is a day before the Turks.

The reason given why the month of Ramadan was fixed upon for this purpose is, that on this month the Koran was sent down from heaven. From this fall of Ramadan none are excused, except travellers and sick persons, under which latter denomination are included all those whose whole health would be manifestly injured by keeping the fast; but then they are obliged, so soon as the impediment is removed, to fast an equal number of other days; and breaking of the fast is ordered to be expiated by giving alms to the poor.

RAMAG, a word used by some of the chemical writers to express alkali.

RAMAGE, a term used for the boughs or branches of trees. Hence, Ramage-fluo, or Falcon, one that is wild and coy, as having been long among the boughs, preying for itself. All falcons retain this name till they have left the nery; being so called in May, June, July, and August. These are very rarely reclaimed. See Brancher, Falcon, and Hawking.

RAMAGE Velvet. See Velvet.

RAMAGURRY, in Geography, a town of Hindooftan; 30 miles W. of Triticinopoly.

RAMAH, a town of Arabia, in the province of Neds-jed; 120 miles N.W. of Jarama.

RAMAH, or Ramalla, Ramoola, Ramola, Ramba, Ruma, or Remphis, a city W. of Jerusalem, between Lydda and Joppa, according to St. Jerome; or between Joppa and Jerusalem, as modern travellers describe it. This is the place which Enfebus and St. Jerome took for Armenia, the country of Joseph. Matt. xxvii. 57.

RAMAI, in Ichthyology, a species of Sciana; which see.

RAMALINGA, in Geography, a town of Hindooftan, in Coimatore; 16 miles S.S.W. of Erroad.

RAMALIS VASA, a name given by some anatomical authors to the vena porta.

RAMANUJ, the name of a religious sect of Hindoos, of the great subdivision of Vaishnava, who worship Vishnu, the perfonification of the preferring power of the deity, in his incarnation of Rama. Of this sect some worship Rama only, some his spouse Sita, and some both Rama and Sita conjointly. (See Rama.) Among the Ramanuj none are addicted to the indecent, or left-handed, mode of worship noticed under the article RADIA as deserving her votaries. (See farther under SAKTA, and Sects of Hindoos.) The different sects of Hindoos are distinguishable by a variety of marks on their foreheads; of which a great many are represented in the second plate, with copious explanations in page 424, of the Hindu Pantheon. The sect of Ramanuy are known by a double upright white line on the forehead, with a red line between, or sometimes a circle or dot. Sometimes the lines are red and the circle black.

RAMAS, Cape, in Geography, a cape on the W. coast of Hindooftan; 21 miles S. of Goa.

RAMASSERAM, a town of Hindooftan, in thecir- care of Rajamundry; 35 miles S.S.E. of Rajamundry.

RAMAYANA, the title of a poem in the Sanserit language, of great celebrity in India, and regarded as sacred by some sects of Hindoos, and greatly venerated by all. Its subject is the exploits of three personages named Rama; but more especially the wars conducted by one of them, named Rama Chandra, for the conquest of Lanka or Cey- lon, from its powerful sovereign Ravena, or rather, indeed, for the rescue of his wife from the hands of that tyrant. It is comprised in seven kandas, or books, containing 24,000 shlokas, or metrical stanzas; named thus: 1. Adi-kanda, containing 64 seftions, and 2850 flanzas; 2. Aoydhyakanda, 80 seftions, and 47 10 flanzas; 3. Aranyaka-kanda, 114 seftions, and 4150 flanzas; 4. Kesikenda-kanda, 64 seftions, 2925 flanzas; 5. Sundara-kanda, 43 seftions, 2045 flanzas; 6. Yugda-kanda, 105 seftions, 4500 flanzas; 7. Uttara-kanda, 90 seftions, 3360 flanzas. The Ra- mayana may be called an epic poem, as it is on one continued, interesting, and heroic action. It is second in celebrity only to the Mahabarat, and perhaps superior to it in reputation for holiness. (See Mahabarat.) We have the auth- ority of Sir William Jones for saying, that this great epic poem, in unity of action, magnificance of imagery, and elegance of diction, far surpasses the elaborate work of Nonnus, in forty-eight books, entitled Dionysiaca; and for believing that the heroes of the poems Rama (patronymically distinguished by the name of Dafrat Rama) and Dionyse are the same.

A curious
A curious parallel might be drawn between the manners and customs described in the two works, the Dionysiac and Ramayana. The processions and rites detailed in the former seem descriptive, with a little licence for poetical embellishment, of those in usage to this day in India. Some of these Bacchic orgies are noticed under our articles Dionysia and Nonius; which see. A keen etymologist would find innumerable lingual coincidences; and, in truth, many of the names of perfons, Bacchus and Dionysos, and of places, as well as original perfons, seem febrerly traceable to the sacred language and rites of the Brahman.

So highly is the Ramayana venerated, that the fourth class of Hindoos, the Sudra, is not permitted to read it. At the end of the first book, a promise is made of great benefit to any individual of the three first classes or tribes who shall duly read it. “A Brahman, reading it, acquires learning and eloquence; a Kshetriya will become a monarch; a Vaitya will obtain vast commercial profits; and a Sudra, hearing it, will become great.” Of these distinctions of tribes or classes, the reader will find due notice under Sects of Hindoos. Under Rama we have stated that his name reiterated is used by several sects as a term of abhorrence, or benediction. The author of the Ramayana, in the vinity of playful edictum, which, from its frequency with oriental poets, has ceased to seem blaming, calls on his readers to “salute Valmiki, the cukoo, who, mounted on the branch of poetry, founds the delightful note of Ram-Ram.”

It has been furnished that the Ramayana, like the Mahabharat, is allegorical, so far as relates to personal adventures; which, in both cafes, are mere machinery for the introduction of a concealed sylem of philosophy and ethics: in the first instance the allegory is physical, in the latter moral. Under the article Mahabharat the allegorical nature of that extraordinary poem is sufficiently shown. The Kuras and Pandus, the heroes of that poem (see Kuru and Pandu), are personifications of virtues and vices. The Ramayana and the Dionysiac relate how their respective Indian conquerors led armies of fayrs. (See hereon under Maruty and Rama.) These fayrs, or monkies, we apprehend to be personifications of winds, or gaseous metaphors. In the Ramayana we find the machinery to confit of the sun and planets, fire, the firmament, wind, water, &c. personified in the gods or regents of those bodies, elements, &c. It has been further furnished that whenever these two extraordinary poems, the Mahabharat and Ramayana, shall appear in English, and their allegories be more fully examined, it may possibly be found, that not only the three Ramas will melt into one, but that all will amalgamate with Kirlihna. Some objections to the identity of the Ramas have been offered of a chronologial nature. Parafa Rama, it is contended, reigned or flourished eight generations before Rama Chandra. Their poetical identity, however, is sufficiently established; and one can scarcely bring such a twofold of allegory, incarnations, and whimsical adventures, to the test of sober historical and chronological accuracy. Personifications of these names may have reigned or flourished at any given period, for they have always been very common, and are fo still.

The Ramayana is so replete with incident, that it is scarcely possible to give any analysis of its subject with sufficient brevity for this work. Unity of action is, however, its characteristic, namely, the recovery of Sita from the hands of her ravisher Ravana, the gigantic tyrant of Ceylon. It may be noticed in passing, that the Ramayana, like the Iliad, is founded on a rape, and that Sita is the Helen of the Hindoo epic. (See Sita.) So inextricably intermixed are the varied subjects of the Hindoo mythological history, that the discussion of one necessarily brings another under notice. This is the cause of such frequent references to and from the articles under which we have endeavoured to give a succinct account of such a number of subjects of that description, distinct apparently, but in reality connected, and often confounded with each other. On the subject of this article, the Ramayana, or for quotations from it, we may therefore refer to the following, among others: Ceylon, Lakshmi, Lanka, Mantra, Parasu Rama, Menaka, Ravana, Hemha, in addition to those pointed to in earlier passages of this article, and in those articles just named.

What precedes, referring to the poem bearing the title of this article, is offered respecting the Ramayana of Valmiki. There are many other poems of the same name in Sanscrit, Prakrit, Hindvi, and many other Hindoo dialects; as well as in Arabic, Persian, Malayon, and others derived from the like source. These are of course of unequal celebrity and merit; and acknowledged to be greatly distant from Valmiki’s divine poem. Even of this it may be said, that the style is frequently flat and diffuse, deficient in ornament, and abundant in repetitions. As well as Valmiki’s work, several others, under the same title, are usually considered with more respect than mere profane poems. One is ascribed to Vyasa, the reputed author or compiler of the Vedas and Puranas. (See those articles.) A considerable portion of several of the latter mythological romances is occupied by the same subject, viz., the adventures of Rama; but in the Vedas no mention is made of this perfon, except, indeed, in some detached parts, reasonably refuted to have been interpolated by zealous fectaries. The titles even of the philosophical and profane poems, commentaries, &c. that in divers languages owe their origin to the Ramayana, would require a catalogue of no incalculable extent to contain them. Among these are included many dramatic works. The quotations from, and allusions to its mythological perfonages and fables, in the works of the minor poets, are incessant; and upon the whole, there is no subject, perhaps, in the whole range of Hindoo mythology, or history, so often in the minds and mouths of that race of all ranks and fefts, as the story of the Ramayana in some of its bearings. That of Krihna rivals it in popularity. Both are chanted by itinerant bards, who illustrate their subjects by exhibiting a series of pictures from the Ramayana and Mahabarat. Women’s fingers frequently accompany the eastern troubadours who are commonly met with in every city, camp, and town of India.

RAMAZZINI, Bernardi, in Biography, an Italian physician of distinction, was born at Carpi, near Modena, in 1633, where his father was a respectable citizen. Having received a classical education from the Jesuits at his native town, he went to Parma for the study of philosophy at the age of 19, undecided what profession to adopt: at the end of three years he selected that of physic, and received the degree of doctor at Parma in the beginning of 1659. He then repaired to Rome for the completion of his studies, and settled in practice in the duchy of Cafora. He was soon obliged by ill health, however, to return to his native air; and, on his recovery, he married, and purfued his profession at Carpi. Finding his reputation increasing, he removed to Modena, at the solicitation of some friends, in 1671, where he met with merited success, and excited the jealousies of his brethren. In 1682 he was appointed professor of the theory of medicine in the university, which had been recently established at Modena, by duke Francis II.; and he continued to fill this office for eighteen years, attending at the same time to practice, and not neglecting the cultivation of polite literature, to which he was particularly partial. The
elegance of his Latin style in his writings, evinces the suc-
cess with which he pursued the study of the classics. In
1720 he was invited to a professorship at the more distin-
guished university of Padua, and removed thither. Though
somewhat advanced in age, he fulfilled the duties of his
chair with an air of importance, not to be surpassed by his junior col-
leagues, for the space of three years, when he was attacked
with a disease of the eyes, which threatened to destroy his
vision, and which, in fact, did ultimately deprive him of
that faculty. Having lost the pleasure of reading, which
was the only source of his regret, he supplied that amufe-
ment by the assistance of his grand-children, who read to
him, and acted as his amanuenses. In 1728, however, the
senate of Venice appointed him president of the college
of physicians of that capital, and in the following year raised
him to the first professorship of the practice of medicine.
He continued to perform the duties of those honourable
posts, at the earnest solicitation of his constituents and pu-
pils, with great diligence, to the end of his life, and died
on his birth-day, November 5th, 1744, in consequence of
an attack of apoplexy, which seized him while he was pre-
paring for his lectures, at the age of 81.

Ramazzini was a member of several of the academies of
science established in Germany, Berlin, &c., and left several
works; the principal of which, and one which will ever
be held in estimation, is his treatise on the diseases of arti-
fts and manufacturers, entitled "De Morbis Artificum Dia-
triba," first published in 1721, and frequently reprinted.
He also published some tracts relative to certain epidemics,
both among men and cattle; some "Ephemerides Baromet-
trice_; a work on the abuse of Peruvian bark; and several
orations delivered in his professorial capacity. All his
works have been collected and published together at Padua,
Genoa, Vienna, and Naples; the edition of London is the

Rambang, in Geography, See Renbang.
Ramberville, or Remberville, a town of
France, in the department of the Vosges, and chief place of
a canton, in the district of Epinal; 19 miles E. of Mer-
court. The place contains 4926, and the canton 14,014
inhabitants, on a territory of 317½ square kilometres, in 28 con-
nunues. N. lat. 43° 21'. E. long. 6° 43'.
Rambin, a town of Anterior Pomerania; 10 miles
W.S.W. of Bergen.
Ramble, a town of Spain, in the province of Cor-
dova; seven miles N.W. of Montelana.—Alfo, a town on the
W. coast of the island of Tenerife; three miles W. of La-
guna.
Rambouillet, a town of France, in the depart-
ment of the Seine and Oise, and chief place of a canton, in
the district of Verfailles, the seat of a tribunal, and of a
national farm, where the sheep are much celebrated for the
fineness of their wool; 27 miles S.W. of Paris. The
place contains 2586, and the canton 9652 inhabitants, on a
territory of 305 square kilometres, in 17 communes. N. lat.
48° 39'. E. long. 1° 54'.
Rambure, a town of France, in the depart-
ment of the Somme; 8 miles S. of Oise.
Ramburelles, a town of France, in the depart-
ment of the Somme; 9 miles S. of Abbeville.
Ramchund-pour, a town of Bengal; 30 miles
N.E. of Calcutta.
Ramchundra, a town of Hindoostan, in the cir-
car of Mahurhurbe; 23 miles S.S.E. of Harripour.
Ramchunpore, a town of Bengal; 60 miles N.
of Dacca.

Rameau, John Philip, in Biography, chevalier de
St. Michel, composer to the king of France, and to l'Aca-
demie Royale de la Musique, or serious opera at Paris, was
born at Dijon in 1683. He went early in his life to Italy,
and at his return was appointed organist at Clermont en
Auvergne, where his "Traité de la Musique" was written,
in 1722. He was afterwards elected organist of St. Croix
of the Bretonnerie at Paris. Here his time was chiefly
employed in teaching; however, he published harpsichord lec-
tons, and several other theoretical works, without distin-
guishing himself much as a vocal composer, till the year
1735, when, at fifty years of age, he produced his first
opera of "Hippolite et Aricie." The music of this
drama excited professional envy and national discord.
Party rage was now as violent between the admirers of Lulli and
Rameau, as in England between the friends of Bononcini
and Handel, or, in modern times, at Paris, between the
Gluckists and the Piccinists.

When the French, during the last century, were so con-
tented with the music of Lulli, it was nearly as good as that
of other countries, and better patronized and supported
by the most splendid prince in Europe. But this nation, fo
frequently accused of more volatilty and caprice than their
neighbours, have manifested a steady perseverance in pro-
curing in their music, which the strongest ridicule and contempt
of other nations could never vanquish.

Rameau only answered his antagonists by new produc-
tions, which were still more successful; and, at length, he was
acknowledged by his countrymen to be not only superior to
all competition at Paris, but sole monarch of the musical
world. From 1733 to 1760 he composed twenty-one operas,
of which the names and dates are annually published in the
"Specècles de Paris," and in many other periodical works.
Rameau's style of composition, which continued in favour
almost un molested for upwards of forty years, though formed
upon that of Lulli, is more rich in harmony, and varied in
melody. The genre, however pleasing to all ears but thofe of France, which had been nutured in it, was carried
by the learning and genius of Rameau to its acme of per-
fec tion; and when that is achieved in any style, it becomes
the buffet of subsequent composers to invent or adopt
another, in which something is still left to be done, besides
servile imitation.

The opera of "Cafior and Pollux" having been long regar-
ded in France as the matter-piece of this composer, we
shall here insert a few remarks upon it, that have been made
on a recent examination.

The overture is the best of this author, upon Lulli's plan.
The opening symphony is beautiful; but why the same
melody was not applied, in the same measure, to the poetry,
we know not, unless the verification required a change of
time; but, in that case, why write the symphony on a sub-
ject that would not suit the words? But those eternal
changes in the measure, which tease and disappunt the ear
of all that are used to other music, is general in serious
French operas, and frequently much to the fault of the poet as
musician. It is, however, wonderful, that this defect was not
sooner discovered. The overcharged tendernes of Ramea-
u's music appears in all his flow movements, which are in
one style, and generally in triple time. This matter perpetu-
ally
tually discovers himself to be a great harmonist; but incurred to a bad taste and style of composition, as well as to bad singing, he has only augmented the defects of his predecessors, and rendered what was rude and clumsy in Lulli still more offensive, by endeavours at sweetness and high f easoning. The appoggiaturas, or leaning notes, being so frequently incorporated in the harmony, renders it crude, and the hanging on every note, as if unwilling to relinquish it, checks and impedes the motion of the air, and gives it a slow and languid effect, however lively the theme on which it is composed. Every passage in such melody resembles a French heroic verse:

"Each is an Alexandria through the song,
That, like a wounded snake, drags its slow length along."

The opening of the second act, "Que tout gemisse," is very fine, and the pathos well applied; but the subsequent air, which is call in an admirable mould, is spoiled by frequent and unnecessary changes of measure; and yet in spite of these defects, and the vocal outrages of mademoiselle Arnould, we were more pleased and affected by this scene, than any other we ever heard at the French serious opera. The march, which has few appoggiaturas in it, is like other Christian music.

The prelude tendre, at the opening of the third act, abounds with too many of these drags, which being equally harsh to the ear and injurious to pulsatixs, seem to prevent the performer from ever falling on his feet; and bar eleventh, the chord of the superfluous fifth, which makes all nature shudder, except our Gallic neighbours, is here continued so long, that it distorts the countenance of every other hearer, like hiera pieta. The minor minuet, page 121, after so long and tiresome a minority, is rich in harmony and graceful in melody. The voice is worie used by the composer than the most insignificant instrument. For after several symphonies that are extremely promising, and the ear has been made to expect a continuance of the preatory strain, nothing is given to the vocal part but broken accents and dislocated measures. In the chaceone, which is admirable, the measure is well marked and well accented. This must long have preceded Jomelli's favourite chaceone, and have served as a model to him, Thobler, and others, in composing this species of dance. More genius and invention appear in the dances of Rameau than elsewhere, because in them, there is a necessity for motion, measure, and symmetry of phrase. And it may with truth be said, that nothing in Lulli's operas was imitated or adopted by the rest of Europe, but the figure of his overtures, or in Rameau's, but the dances.

But though the several merits of this musician have been too much magnified by partizans and patriots in France, and too much depreciated by the abettors of other systèmes and other styles, as well as patriots of other countries, yet Rameau was a great man; nor can the profeffor of any art or science mount to the summit of fame, and be elected by his countrymen supreme dictator in his particular faculty, without a large portion of genius and abilities.

The successful revival of his opera of "Caïtor and Pol-lux" in 1754, after the victory obtained by his friends over the Italian burletta fingers who had raised such disturbance by their performance of Pergolesi's intermezzo, the "Serva Padrona," was regarded as the most glorious event of his life. The partizans for the national honour could never hear it often enough. "This beautiful opera," says M. de la Borde, "without any diminution in the applause or pleasure of the audience, supported a hundred representations, charming at once the soul, heart, mind, eyes, ears, and imagination of all Paris."

From this era to the time of his death, in 1767, at eighty-four years of age, Rameau's glory was complete. The Royal Academy of Music, who all regarded themselves as his children, performed a solemn service in the church of the Oratory, at his funeral. And M. Philidor had a mas performed at the church of the Carmelites, in honour of a man whose talents he so much revered. See Base, Base Fondamentale, and Countermelodic.

RAMEL, a name given by some chemical writers to rhubarb.

RAMEDEGA, in Geography, a town of Hindostan, in the circuit of Gangpour; 15 miles S.W. of Pada.

RAMEE, a town of Bengal; 50 miles S. of Ila

RAMEEAPATAM, a town of Hindostan, in the Carnatic; 30 miles S. of Ongole.

RAMEEPUR, a town of Hindostan, in Allaha-bad; 35 miles E.N.E. of Gazipour.

RAMELLI, Agostino, in Biography, a celebrated Italian mechanist and engineer, was born, in 1530, at Ma-fanzana, in the diocese of Milan. Having entered the army, he rendered a considerable time under the marquis de Marignano, a general of Charles V. After this, he served under the duke of Anjou as captain, or engineer, at the siege of Rochelle, in 1573, where he was dangerously wounded, and taken prisoner. When that prince, afterwards Henry III., was called to the crown of Poland, he was the friend of Ramelli, and he nominated him his engineer when on the throne of France. In 1588 he published a work in Italian and French, entitled "Le Diverle et Artificieuse Machine del Capitono Agolino Ramelli," &c. with nearly 200 figures, describing a great number of machines for various purposes, most of his own invention, and which exhibit much ingenious contrivance. The work is very scarce, and is much prized by the curious.

RAMELSCHACH, in Geography, a town of Austria; 5 miles S.E. of Meillai.

RAMELTON, or Rathmelton, a small port-town of the county of Donegal, Ireland, situated on a bay at the bottom of Lough Swilly. It is 117 miles N.W. by N. from Dublin.

RAMENAPILLY, a town of Hindostan, in the cir-
cor of Rajampur; 42 miles E. of Rajampur.

RAMENTUM, in Botany, a form of pubescence in
plants, which, as the name signifies, has the appearance of a hair, being flat, membraneous, mostly irregular in size and shape, quite unlike the uniform hairs or bristles of which the clothing of moss plants consists. (See Pubescent.)

The above term was first used, if we recollect rightly, by L'Heritier, and occurs in some species of Begonia. The fealnees of Ferns is of a similar nature.

RAMERUP, in Geography, a town of France, in the department of the Aube, and chief place of a canton, in the district of Arcis-sur-Aube; 6 miles E. of Arcis-sur-Aube. The place contains 123, and the canton 8870 inhabitants, on a territory of 440 kilometres, in 29 communes.

RAMESAN, an oriental term for a month of fasting, very religiously observed among the Turks, and otherwise called Ramadan; which see.

RAMESERAM, in Geography, a town of Hindostan, in the circuit of Cuddapa; 6 miles E. of Gandicotta.

RAMETTA, a town of Sicily, in the valley of De-
mona; 6 miles W. of Meffina.
RAMEX. (ramus, a branch,) in Surgery, a rupture, or hernia. See HERMIA.

RAMEX Feminae See Circumcision.

RAMGAD. in Geography, a town of Hindoostan, in Bahar : 10 miles W. of Bahar.

RAMGARY, a town of Hindoostan, in the country of the Notts : 15 miles W.N.W. of Palauchererry.

RAMGAUT, a town of Hindoostan, in the subah of Delhi : 57 miles S.E. of Secundra.

RAM-GETTER, in Rural Economy, a term applied by the medlaad breeders to such rams as are proper for getting ram-flock, in contradistinction to such as are fit only for getting wether-flock. See RAM.

RAMGONGA, in Geography, a river of Asia, which rises in Tibet, and runs into the Ganges, 10 miles N. of Canogg.


RAMGUR, a circuit of Bengal, bounded on the N. by Bahar, on the N.E. by Curneedkagh, on the S.E. by Pachera, on the S. by Nagpur, and on the W. by Koonda and Toree : about 90 miles long, and 60 broad. — Also, the capital of this circuit : 135 miles W.N.W. of Calcutta. N. lat. 23° 20'. E. long. 85° 41'. — Also, a town of Hindoostan, in Dowlatbad : 55 miles S. of Neemul. N. lat. 18° 3'. E. long. 79° 15'. — Also, a town of Hindoostan, in Malwa : 8 miles S. of Rargoopour. — Also, a town of Hindoostan, in the subah of Delhi : 5 miles N. of Coel. — Also, a town of Hindoostan, in Guzerat : 50 miles E.S.E. of Surat. — Also, a town of Bengall : 15 miles N.W. of Madnapour.

RAMGUR. See SERNAH.

RAMGURRA, a town of Hindoostan, in the Mylore, captured by the English in 1791 : 42 miles N.E. of Serunga-patam.

RAMHYTTE, a town of Sweden, in Westmanland ; 36 miles from Stockholm.

RAMI, in Hindu Mythology, one of the many names of the goddes, Parvati; which see. Under this name she is said to be worshipped at the splendid temple on the island called Ramiferum, between Ceylon and the cape named by us Comorin, but which should be called cape Kaimarn, or Kumarn, another of the names of this goddess, and meaning the virgin. (On this point see LANKA and PARVATTI.) Sami is the name of a tree or wood Sacred to Parvati, and is sometimes called Sami Ram. Rami is the term that is here employed to express the origin of the Seminarii of the Greeks. (See hereon Af. Rep. vol. iv. p. 282. vol. vii. p. 246. Svo, ed.) A description of the celebrated temple of Ramiferum will be found under that article. See also SAMI.

RAMI-AVENPOUR, in Geography, a fort of Bengal : 27 miles S.S.W. of Budwang.

RAMIFICATION, the production of branches or branches, or of figures resembling braches.

RAMIFICATIONS, in Anatomy, are the divisions of the arteries, veins, and nerves, arising from some common trunk.

RAMIGRI, a word used by some writers as a name for colophony.

RAMILLIES, in Geography, a village of France, in the department of the Somme and Maine, at the source of the river Gere, worthy of being recorded on account of a battle fought here in the year 1562, between the allies commanded by the duke of Marlborough, and the French under marquis Villeroy. The confederates took the whole of the enemy's baggage and artillery, and about 120 standards, 600 officers, and 6000 private soldiers: about 800 were killed or wounded. The loss of the allies did not exceed 3000 men : 13 miles N. of Namur.

RAMING, a town of Austria : 11 miles S. of Steyr. — Also, a town of Persia, in the province of Irak : 40 miles E. of Coorar.

RAMINGAM, a town of Hindoostan, in Dowlatbad : 10 miles N. of Oadigher.

RAMINGSDORF, a town of Austria : two miles E. of Steyr.

RAMINGUE, in the Mangi. A hodie gets this name that is seditive, and refits its leaves to the spurs; that is, defends himself with malice against the spurs; sometimes doubles the reins, and frequently yorks to favour his disobedience. See TIECKELIS and DOUBLE.

RAMIS, BARTOLOMEO, in Biography, a Spaniard, the first modern who flattened the necessity of a temperament in musical instruments, of which the tones are fixed. He was contemporary with Francisco, and in 1462 published a work, entitled "De Musica, Tractatus, five Musica practica."

He seems to have converted Pietro Aaron to his opinions: as that theorist manifestly exalts the quality of Ramis on all occasions at the expense of Francisco.

The Spaniard was attacked in a rough manner by Nicholas Burtius, for differing from Guido in his division of the monochord, in a tract entitled " Musices Opusculum cum Defens. Guidonis Artini adversus quendam Hiptanum veritas praevinctor." Bemun. 1487. This tract, printed in black letter, is in the Ashmol. Collect. among the books of Art, Wood.

Burtius imagined the honour of Guido to be injured by the Spaniard, as Guido used the Pythagorean proportions, and had never thought of a temperament. Burtius, in his turn, was handled very roughly by Spataro, the disciple of Ramis (Joannes Spadarius Bononiensis, Musices ac Bartolomi Rami Paulo ejus Preceptoris honesta Defensor in Nicol. Burtij Parment. Opusc. Bolognae, 1491.): and the venerable Francisco, finding himself very rudely handled in the dispute by the sufferers of temperament, in 1522, when he was upwards of seventy years of age, took up the defence of Pythagoras, as Fontenelle, at near a hundred, did of Des Cartes. After this, the war became general, and continued to rage with great violence for more than a century, between the friends of tempered scales, and the adherents to ancient proportions and equal harmonies.

RAMISERAM, in Geography, an island in the Indian sea, between the island of Ceylon and the coast of Coromandel; to which there is a passage of about 12 or 14 leagues from the island of Manar, on the coast of Ceylon. But the advantages that might be derived from this speedy communication are in a great measure prevented by the numberless shallows and sand-banks, which every where interrupt the passage, and which are so high, that many of them are dry except during the monsoons. There is in particular a line of sand-banks, which runs quite across from Manar to Ramiferam, denominated Adam's bridge, and also Ram's bridge, because God is said to have come by this way into Ceylon. (See Adam's Bridge and MANAR.) From Ram, Ramiferam takes its name, and it has a large temple dedicated to him. The shortness of the passage from Ramiferam to Manar is particularly useful on account of the speedy conveyance it affords to people on business, and the communication of intelligence. The messengers who usually go from Culein to Manar, a distance of 160 miles, in three days, take boat here, and cross over by Adam's bridge to Ramiferam; and then proceed along the Coromandel coast to Madras. An express
express in favourable weather will run from Columbo to Madras in eight days, and the journey has been accomplished once in seven days. (See Manka.) The isle of Ramiseram, which is the limit of the Hindoo religion in more modern times, and of the conquests of the Mussulman princes, is, as we have said, separated from Ceylon by Adam's bridge. The island is low, sandy, and uncultivated, except with a few scattered Palmira and cocoa-trees. The pagodas, for which it is so famous, lie on the Ceylon side, near the sea, and are the resort of innumerable multitudes of different sects of religion in India, during the feason of certain festivals. The numerous pagodas are constructed in the same style with those on the Coromandel coast; and they are surrounded with the houses of the Brahmins, priests, and other religious persons, whose zeal leads them to attend on their temples; among whom, in particular, may be seen the descendants of the Tamuls, Telingas, Canarians, Mahtrattas, and Orias, who compose a great body of the original inhabitants of the southern peninsula. Their houses are built of the cocoa-tree, in small figures and streets, where their families are seen reclining on the little mud terraces, and under the payals or virandals. They do not allow Europeans to enter these temples; but they are known to revere those of the coast in their crowded ornaments, spires of brickwork, long porches in front, and viias, at the extreme end of which are placed the deities, in an obscure position, surrounded by lamps burning day and night. The same reverence for strangers subsists among all the southern Brahmins. The Brahmins allow no labour or cultivation to be carried on in the island of Ramiseram, considering it altogether as sacred. The contributions of those who visit it are sufficient for the support of the temples. Several of the neighbouring Poligar chiefs contribute largely, and some of these rajahs have statues erected to them for their gifts. The chief pagoda has several of these statues in its different figures. Low as the land lies in this island, good water is easily procured; for on scooping it up, the water collects immediately in the holes; but this is not the case in Manka and the wet coast of Ceylon.

The guardianship of this sacred isle belongs to a family of devotees, called "Byrageses," the chief of whom is always doomed to celibacy: the succession being carried on by the fathers or the collateral branch, who are permitted to marry. This institution is similar to that of the sovereignty of the Travancorians and Nairs of the Malabar coast. The clothes and turbans of the devotees are of a tawny red colour, decorated with large black beads, of a particular kind of wood. From the pagodas just mentioned there runs out a long narrow piece of sand, terminating in a point, within a mile of which is a choultry at Tuna Goody. This is a square of houses with a court inclosed for the accommodation of pilgrims, who come to the farthest point of the island to perform their ablutions in the sea, the most sacred and the purest of their ceremonies. A Brahmin takes care of this choultry, and a pole with a light is fixed at the end of the point to direct the pilgrim. N. lat. 9° 18'. E. long. 79° 22'. Percival's Ceylon.

Of the temple in this island we shall give some account, extracted from a publication of Mr. Cordiner, who visited it. The external appearance is not remarkably grand, and at a distance, no idea is excited of the minute ornaments and labour of workmanship which strike the eye on a nearer inspection. All the architecture seen without doors is insignificant, compared with the magnificence of the interior. After an examination of the whole structure, which is entirely of hewn stone, Mr. C. deemed the extent of masonic labour in its erection, most have been equal to that of any of the most splendid cathedrals of Europe. "On entering it we were," he says, "completely astonished at the grandeur of the workmanship, and extent of the dimenions, which far surpassed any idea that we had formed of Indian magnificence." From the west gate a low gallery, 144 feet in length, with three rows of pillars on each side, leads down to the centre of the building; where it branches off, in galleries similarly constructed, to the right and left, each extending 150 feet, then running from west to east 520 feet, and enclosing an oblong rectangular space. The gallery runs also along the centre of the temple 788 feet, and a similar gallery runs across from north to south, where are like entrances, intersecting the former in the centre of the rectangular space. All the galleries have on each side triple rows of mafy stone pillars, of highly laboured workmanship. Those in the front line are the largest and most superb, having a huge lion, with the mouth wide open, sculptured in bas relief, above three distinct capitals, over which are a scroll, and a richly ornamented cornice. Statues of the size of life are attached to many of the pillars, representing gods and deified persons. The pillars stand on a continued basement, forming the floor of the galleries, raised three feet, with steps to ascend by, all of stone. The roofs of all the galleries are flat, formed of stones reaching across, from the projection of one cornice to that of the other. The galleries are eighteen feet wide, and in the centre thirty feet high from the floor. The number of pillars within the temple amounts to 2625. The edifice is inclosed by a heavy stone wall, 20 feet high, 830 feet from east to west, and 625 from north to south. Large as these dimensions may appear, they are dwarfed to be but small compared with those of temples on the continent of India, one of which covers a square mile of ground. The covered gallery, fronting the south gate, which seems unfinished, strikingly resembles the entrance of the Elephant cave, near Bombay. Solid pyramidal erections surmount the western and eastern entrances, composed externally of a grand number of small pillars, and two, in the form of window frames or gateways, riving one above another, in seven different stories. That over the western, which is the principal entrance, appears to be 150 feet high; the eastern seems lower and unfinished. The north and south gates are less majestic than the others; but their completion is said to be intended, when they will be similarly surmounted and ornamented as the western portal. Privileged persons, among whom were women carrying water-pitchers, appeared constantly passing and re-passing about the interior of the temple.

Two hundred Brahmins are attached to this temple, and supported in ease and luxury by its endowments. It is dedicated to Siva, the destroying power, called by the vulgar Rama Lingam. It contains likewise, Mr. Cordiner says, images of Vishnu the preserver, and of all the subordinate divinities. Of Brahma, the creator, he states, the Hindoos never dare to form any likeness. This is a common error, that is explained and corrected in the article IDEOLATRY of this work.

A broad street runs parallel to each side of the temple composed of comfortable houses, and large chouchies for the accommodation of pilgrims and travellers, of stone, with flat roofs supported in front by pillars; the fronts being open. In one of these Mr. Cordiner observed two ivory palankeens inlaid with gold, the property of officers belonging to the sanctuary. In others he noticed five cairiages, called by the English Smancy coaches, used for the purposes of carrying the idols in procession: the use to which the ivory palankeens are, we apprehend, also applied.
These carriages are described as solid masses of wood, of a pyramidal shape, intended to symbolize the Linga. (See Linga.) The exterior of their coaches are covered with grotesquely obscene carving.

At the external corners of the temple, and in the streets of the town, there are smaller temples in honour of different deities, and containing images. In some of the streets spreading trees, among them the ficus religiosa and tamarind, are surrounded with square stone terraces, on which are placed little images of Poller or Ganea, (see Pollear) the Linga, two serpents entwined, and other emblems of Hindoo mythology. These terraces are used for contemplation, or more active religious duties, as noticed under the article Pradakshina. Rows of fruit-trees, among them the cocoa-nut, plantain, and pomegranate, stand in gardens beyond the north and south walls of the temple.

On the opposite side of the island, near the sea, distant about eight miles from the temple, is the ancient fort and choultry of Pombom. The road between is very splendidly paved with smooth stones, each six feet by four; and the greater part of the road is nobly shaded by the most beautiful and majestic trees. The larger trees of this superb avenue are surrounded by smooth-raked terraces of masonry, on which travellers rest in comfort, completely shaded. About half way between the grand temple and Pombom is a very elegant small temple, built on the same general plan with the larger, having two maffy towers raised in the centre of the oblong area, and a covered walk, with three rows of pillars on each side, all round. The outside of the towers is completely covered with flutes in miniature, representing all the variety of their mythological divinities. The choultry, for the accommodation of pilgrims and travellers at Pombom, has two fronts, and three inclosed squares; and is surrounded by piazzas levelled several feet, with square pillars and terraced roofs. Contiguous is a small temple, the door of which was open, displaying an image of Ganea or Poller, in the usual form, elephant-headed and pot-bellied, ornamented with necklaces of flowers.

There are several other elegant temples on this interesting island, which is entirely dedicated to the purposes of religion. No plough is allowed to break the soil, and no animal, wild or tame, is ever killed on it.

Dancing girls, mountebanks, and beggars, abound here, as in other reftorts of the idle and wealthy.

The small remains of antiquity still extant on Ceylon, sufficiently prove that similar religious institutions did once exist there, and that chooltries and temples were erected at the different places, all the way from Manar through the island, 200 miles, to Dondra, its southern extremity, and the extreme extent of Hindoo pilgrimage. At the latter place, the ruins of a temple dedicated to Siva are still to be recognized; but only one row of scattered pillars, and a few remnants of broken images have survived the fanatic fury of the early European invaders. Rama's peaceful island falling under the protection of a more liberal and enlightened government, fortunately escaped those religious tempests, which spread devastation round the coasts of Ceylon.

Lord Valentine has more recently visited this interesting scene, and Mr. Salt, who accompanied his lordship, has published a very elegant view of the temple. The entrance is described to be through a gateway, about 100 feet high, covered with carved work to the summit. The door is 40 feet high, composed of single stones placed perpendicularly, with others crossing. This massive workmanship reminded lord Valenta of the ruins of Egyptian architecture. He describes the quadrangle to be about 600 feet each side, and says that, on the whole, this temple is the finest piece of architecture that he had seen in the east. Words, he says, cannot describe its magnificence. The concourse of pilgrims is very great, and brings in a large sum; each paying according to his rank. The raja of Tanjore has been accustomed to the year before, but could not afford it; as in presents and various expences, it was estimated that his highness could not have performed this act of devotion under 60,000 pagodas, about 25,000l. sterling. His whole family would of course have expected to participate in the happiness and benefits of the pilgrimage. The idol uses no water but what is brought from the Ganges by fakirs; with this it is bathed every morning; and this holy water, thus acquiring additional sanctity, is fought and purchased by the devout for fin-expelling purposes.

RAMISTS, in the History of Learning, the disciples of Peter Ramus, who was born in a small village in Picardy, in 1515, and from being a servent in the college of Navarre at Paris, became, by his talents, industry, and perseverance, one of the most famous professors of the sixteenth century. By attacking the authority of Aristotle, and attempting to substitute in the place of his logic a method of reasoning better adapted to the uses of rhetoric and improvement of eloquence, he excited a terrible uproar in the Gallic schools; so that the two first books he published, viz. "Institutions Dialecticae," and "Aristotelicon Animadversiones," were prohibited through the kingdom of France, and the author prohibited from any more teaching philosophy. His enemies persected him with lampoons and satires, and even held him up to public ridicule on the flage. However, Ramus afterwards recovered his credit, so that he obtained the royal professorship of philosophy and eloquence, and afterwards of mathematics, at Paris, in 1547. But his enemies were inveterate in their persecution of him, and as soon as it was known that he favoured the party of the Hugonots, he was obliged once again to withdraw himself from the effects of their resentment. In the intervals of peace, he returned to his flation; but in 1568, when the civil war was a third time renewed, he resolved to leave France, and make a tour through Germany. After spending three years in visiting the principal German universities, and receiving many tokens of respect, he resolved, fatally for himself, in 1571, to return to his own country. Accordingly he settled at Paris, where he perished in the massacre on St. Bartholomew's day. On the tumult of this execrable day, Charpentaire, professor of mathematics, who had been eclipsed by the superior talents of Ramus, seized the opportunity of being revenged upon his rival, and, under the pretence of religion, employed assassins to murder him. His body was afterwards thrown into the street to the enraged pupils of Charpentaire, who dragged it ignominiously along the streets, and then cast it into the Seine.

The Disciples of Ramus, such was the astonishing influence of their master's learning and character, prevailed so far as to banish the Peripatetic philosophy from several cabinets of learning, and to substitute in its place the syllogism of their master, which was of a more practical kind, and better adapted to the purposes of life. Although he had considerable merit in exposing the defects and inconveniences of the Aristotelian philosophy, he did not seem to have been equally successful in his attempt to establish a new logical institute. The general outline of his plan is as follows: Considering dialectics as the art of deducing conclusions from premises, he endeavours to improve this art, by uniting it with that of rhetoric. Of the several branches of rhetoric he considers invention and disposition...
position as belonging equally to logic. Following chiefly
the example of Ciceron, he divides his treatise on Dialectics
into two parts; the first of which treats of the invention of
arguments, the second of judgments. Arguments he de-
rects not only from what the Aristotelians call middle terms,
but from any kind of propositions, which, connected with
another, may serve to prove any affirmation. Of these he
counters various kinds. Judgments he divides into
axioms, or self-evident propositions, and “dianoës,” or
deductions by means of a series of arguments. Both these
he divides into various classes; and illustrates the whole by
examples from the ancient orators and poets.

In the logic of Ramus, many things are borrowed from
Aristotle, and only appear under new names; and many
others are derived from other Grecian sources, and particu-
larly from the dialogues of Plato, and the logic of the
Stoics. Whillest the author has the merit of turning the art
of reasoning from the futile speculations of the schools to
forensic and common use, his plan is defective in confining
the whole dialectic art to the simple object of disputation,
and in omitting many things which respect the general con-
ture of the understanding, and the investigation of truth.
Defective as the system of Ramus is, lord Bacon (Augm.
Se. i. vi. c. 2.) has passed too severe a censure upon him,
and others have concurred in it: for he is unquestionably
entitled to great commendation for having, at the period in
which he lived and wrote, with so much firmness and
perseverance, asserted the natural freedom of the human un-
derstanding. The logic of Ramus obtained great authority in
the schools of Germany, Great Britain, Holland, and
France; and science derived ultimate advantages from the
treatises which were written between the followers of
Ramus and those of the Stagyrite. But the fame of Ramus
vanished before that of Des Cartes. Brucker’s Phil. by
Enfield, vol. ii.

RAMLA, in Geography, the original Arimathea, a town of
Palestine, distant one-third of a league from the village of
Loudd, or the ancient Lydda and Diospolis. This town is
almost in as ruinous a state as Loudd itself. Within its
boundaries nothing is found but rubbish; nevertheless, the
agriculture of Gaza refines here in a feral, the floors and walls
which are tumbling down. He maintains about 100 house-
men, and as many Barbary soldiers, who are lodged in an
old Christian church, the nave of which is used as a stable,
and in an ancient kan, which is disused with them by the
founders. The adjacent country is planted with lofty olive
trees, disfigured in quinences. Amidst these plantations,
which are decaying, are found dry wells, cisterns fallen in,
and vault vaulted reservoirs, which prove that, in ancient
times, this town must have been upwards of 1/2 league in
circumference. At present it feerely contains 200 fa-
milies. The little land, which is cultivated by a few of
them, belongs to the mufti, and two or three of his relations.
The rent content themselves with spinning cotton, which is
called purchased by two French houses established there.
At Ramla there is also a soap manufactory, the produce of
which is almost wholly sent to Egypt. In 1784 the aga
built here a wind-mill, which, says Volney, is the only one
I have seen in Syria or Egypt, though they are said to have
been invented in these countries. The only remarkable an-
tiquity at Ramla is the minaret of a ruined mosque on the
road to Yafa. By an Arabic inscription, it appears to have
been built by Saïd-el-din, sultan of Egypt. From the
summit, for it is very lofty, the eye discerns the whole chain
of mountains, which begins at Nablous, and skirting the
plain, levels itself toward the south. Volney’s Travels in
Egypt and Syria, vol. ii.

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RAMLEAH, a mountain of Arabia, in the province of
Nedsed, extending from S.W. to N.E. about 250 miles;
the S.W. extremity being 80 miles E. of Kalaat el
Moilah.

RAMLER, Charles-William, in Biography, a cele-
brated German poet and professor of belles lettres at Berlin,
was born at Colberg in the year 1725. He was distin-
guished at a very early period by his poetical genius; and
in 1754 he published a poem, entitled “The Game of Chefs,”
which displayed a considerabe share of genius. In 1758 he
translated the abbé Batteaux’s Treatise on the Belles
Lettres, which he adapted to the genius of his native lan-
guage, and added some dissertations on the German style
and verification. In the following year he published, in
conjunction with Leffing, the epigrams of Logan, an
author who, notwithstanding his great merit, had been suf-
fered to remain in obscurity. In 1760 he published “Sacred
Cantatas,” which were followed, during the next 20 years,
by a great number of other publications, chiefly poetical,
of which a list is given in the General Biography. In the
year 1780 Ramler turned his attention to several of the old
German poets, and published at Leipzig the Epigrams of
Wernicke, Opitz, Ticherman, Andrew Gryphius, and
Adam Olearius. He was so successful in polishing the
works of others, and gave such proofs of his taste and cri-
tical talents, that Göse, one of the most distinguished Ger-
aman amatory poets, allowed him full liberty in his last will
to retain or reject such parts of his poems as he might think
proper. In 1782-3 he published at Berlin a translation of
the poetical pieces in the different volumes of the Spectator,
which he followed, in the subsequent ten years, by a variety
of other works on different subjects; among which may be
mentioned “A Short Introduction to Mythology, in two
Parts.” Ramler has been styled the German Horace; and
his biographer says, that though his verses disfay perhaps
less boldness and simplicity than those of the Roman, they
equal them in sublimity, and surpass them in harmony. It
has been remarked to the honour of Ramler, that he at-
tached to him Frederic the Great, and his successor, by his
poetical talents; from the latter he had a considerabe pen-
sion paid him during the closing years of his life. Ramler
was one of the directors of the national theatre at Berlin,
and professor of the belles lettres in the school of the corps
of cadets; but the latter office he resigned in 1790. Gen.
Biog.

RAMME, in Geography, a river of the duchy of Bremen,
which joins the Ouche, near its source.

RAMMED Earth Buildings, in Rural Economy, are
such as are raised with some sort of earthy material. This
mode of building with earthy materials is supposéd by some
to have been known at a very early period, and has been
long practised with success in the southern parts of France,
especially about Lyons, though little understood in any
other part of Europe until lately. This method has, how-
ever, appeared to have so many advantages, that it was
made trial of in different places in this country; and the re-
result has been so favourable, that the practice seems to de-
fer the attention of the proprietors of land, in all situa-
tions where buildings are to be erected on a cheap and
economical plan. In order to facilitate the knowledge of
the art, Mr. Holland has presented the public with the
method of performing the buildings, in a paper, translated
from a French work on the subject, inserted in the first
volume of Communications to the Board of Agriculture, in
which he says that the French writer, M. Francois Coin-
teraux, remarks, that the possibility of raising the walls of
houses two or even three stories high, with earth only,
which will sustain floors loaded with the heaviest weights, and of building the largest manufactories in this manner, may oftenon every one who has not become an eye-witnes of such things. It is a method, which in the above district of France is known by the term forge; but as it is accomplished by the ramming or compelling earth, or earthy substances, in moulds or cafs, the above term has also been applied to it. See Forge, Building in.

RAMMEKENS, in Geography, a sea-port town of Holland, in the Isle of Walcheren, formerly one of the best harbours in Zeeland. This town, which was constructed as a fortress in the year 1547, and called "Zeebourg," was one of the towns pledged to queen Elizabeth by the states general for the succours the lent them against Spain in the year 1585; three miles E. of Flushing.

RAMMER, in Agriculture, a term applied to a substance which forms a part of the subsoil or sublittara of particular districts. It is usually covered with a thin weak earth or mould in some places. It is penetrable by the roots of some plants, but not without that is, very unfriendly to the vegetation of plants in general. It is frequently met with in Chehure and other counties. See Soil.

The term signifies a composition of various kinds of clay, white sand, and gravel, which is intimately intermixed with a small portion of oysid of iron. It is for the most part found under a weak brown or grey earth which is rarely more than four or five inches in depth in the above district, lying in strata of from eighteen to thirty inches in thickness, upon a white or red sand or clayey marle, the latter often partaking of its nature for the depth of some feet. Rammer or ramelly soils are therefore constantly of a barren and unproductive avature.

RAMMELBERG, in Geography, a large and lofty mountain in Westphalia, celebrated for its mines. These mine-works yield lead, copper, silver, fome gold, borax, lapis calaminaris, zinc, sulphur, jet, vitriol, and yellow ochre. It lies near Goslarn.— Alto, a town of Westphalia, in the county of Mansfeld; three miles S.E. of Wippra.

RAMMELLY, in Agriculture, a word used to signify such crops as are tall or rank, as beans, &c.

RAMMER, a well-known implement formed of wood in different ways, according to the purpose for which it is to be used. These implements are very necessary in putting poles into the ground, in inclining land, in order to clothe the earth firmly about them, as well as for laying down turf or sods, in order to render it smooth and even. See Beetle.

Rammer of a Gun, the gun-flick; a rod or staff used in charging a gun, to drive home the powder to the breech, as also the shot, and the wad, which keeps the shot from rolling out.

The rammer of a great gun is a cylinder of wood, whose diameter and length are each equal to the diameter of the shot, with a handle fixed to it. See Spung.

RAMNA, in Geography, a mountain of Bosnia; 16 miles N. of Orach.

RAMNAGUR, a town of Hindoostan, in Bahar; 42 miles N.E. of Durbungah.— Alto, a town of Bengal; 10 miles N.E. of Kilhergera.— Alto, a town of Hindooostan, in Oude; 27 miles N.E. of Lucknow.

RAMONCHAMP, a town of France, in the department of the Volguys, and chief place of a canton, in the district of Remiremont. The place contains 2385, and the canton 11,325 inhabitants, on a territory of 245 kilometres, in 6 communes.

RAMONDON, Lewis, in Biography, an English finger, who first appeared on the stage of Drury-lane in 1706. But he sung in Arinoc, and Pyrhus and Demetrius, when these operas were performed at the Queen's theatre in the Haymarket. He appears no more as a public singer after this period, but his name occurs as a composer in a collection of songs called the "Merry Musick," 1715; and as the editor of the opus, or "the song tunes in the opera of Camilla, contrived and fitted to the harpichord or spinet," in the title of which it is said, "that the lefions being placed on five lines render them proper for a violin and a lute." Almost all organ and harpichord music was till this time written and printed on five lines.

RAMOOI, in Geography, a town of Arakan; 60 miles N.N.W. of Arakan.

RAMOR, LAUGH, a lake of Ireland, in the southern part of the county of Cavan, which contains several islands, on which are held the runs of some ancient castles. These were formerly adorned with wood, but are now bleak and desolate. The river Blackwater, which issues from it, joins the Boyne at Ravan. Lough Ramor is about 15 miles S. from Cavan.

RAMOS, or LAMOS, a river of Africa, which runs into the Atlantic, 60 miles N.N.W. of Cape Formosa. N. lat. 5° 45'.

RAMS, D investigated in the river of the Amazons, about 70 miles long, and from 10 to 20 broad; 60 miles above Pausix.

RAMOSE LEAF, in Botany. See Leaf.

RAMOTH, in Scripture Geography, a famous city of Pallene, in the mountains of Gilead, and hence called Ramoth-Gilead. This city belonged to the tribe of Gad. It was affixed to the Levites, and was one of the cities of refuge beyond Jordan. According to Ezechias, it was 15 miles E. from Philadelphia, but St. Jerom places it in the vicinity of Jabok, and consequently N. of Philadelphia.

RAMOUCCI, in Geography, a river of Abissi, which runs into the Dews, N. lat. 50° 20'.

RAMOURY, a town of Hindoostan, in the circular of Hindostan; 20 miles E. of Hurdah.

RAMPAH, a town of Hindoostan, in the circular of Rajamundry; 40 miles N. of Rajamundry.

RAMPANT, in Heraldry, is applied to a lion, bear, leopard, or other beast, in posture of climbing, or standing upright upon his hind-legs, and rearing up his fore-feet; shewing only half of his face, as one eye, and one ear.

The term is French; and signifies, literally, creeping. It is different from soluant, which denotes a posture less creft, or somewhat flowing forwards, as if making a saul.

This posture is to be specified, in blazoning, in all animals, except in the lion and griffon; it being their natural situation.

RAMPARA, in Geography, a town of Hindoostan, in Concan; 20 miles N. of Gheria.

RAMPART, or RAMPH, in Fortification, a wall, bank, or elevation of earth about the body of a place, to cover it from the direct fire of the enemy, and of sufficient thickness to resist the efforts of the cannon for many days; and formed into bastions, curtains, &c.

The word is formed from the Spanish amparo, defense, or covering.

Upon the rampart the soldiers continually keep guard, and pieces of artillery are planted there for the defence of the place. Hence, to shelter the guard from the enemy's shot, the outside of the rampart is built higher than the inside, i.e. a parapet is raised upon it with a platform. Hence, also, earth not being capable to be raised perpendicularly, like stone, the rampart is built with a talus or slope, both on the inner and outer side.
The rampart is sometimes lined, i.e. fortified with a stone wall within, otherwise it hath a berme. It is encompassed also with a moat or ditch, out of which the earth that forms the rampart is dug.

The height of the rampart should not exceed three fathoms, this being sufficient to cover the houses from the battery of the cannon: neither ought its thickness to be above ten or twelve, unless more earth be taken out of the ditch than can be otherwise hallowed. See Construction, according to M. Vauban's first Method.

The ramparts of half-moons are the better for being low, that the small fire of the defendants may the better reach the bottom of the ditch; but yet they must be so high as not to be commanded by the covert-way.

Rampart is also used in Civil Architecture, for the space left void between the wall of a city and the next houses. This is what the Romans call pomarium, in which it was forbid to build, and where they planted rows of trees, for the people to walk and amuse themselves under.

Ramparts, in Geography, a town of Bengal; 8 miles S.E. of Rungpore.

Rampeting, or sodding, denotes the process of building sod or turf walls, or banks.

Rampfersgrube, in Geography, a town of Germany, in the country of Heneberg; six miles W. of Meinungen.

Ramphastos, the Toucan, in Ornithology, a genus of birds of the order Picæ, of which the generic character is as follows: Bill very large, light, hollow, convex, serrate at the edges; each mandible incurvate at the tip; nostrils behind the base of the bill, long, narrow; the tongue is feathered at the edges, the foot motley climbers.

The birds of this genus first became known to naturalists on the discovery of South America, and to the warmer regions they appear, in general, to be confined. Like the hornbills, they are distinguished by the size of their beaks, which, in some species, is nearly equal to that of the whole body. It is, however, of a very light substance, and, in the living bird, it is compressible between the fingers. Both mandibles are serrated in an outward direction; the tongue is of a highly singular form, representing the appearance of a very narrow lanceolate feather, being of a somewhat horn or cartilaginous nature, and divided on each side into innumerable short and close-set fibres; in consequence of which it was described by some early writers on natural history as a real feather, supplying the place of a tongue.

The orbits of the eyes are generally bare. The toucans are supposed to feed on fruits, but in a state of captivity they will eat animal food. They deposit their eggs, which are usually two in number, in the hollows of trees, on the surface of the decayed wood. These birds have been as yet met with only in South America, and there merely between the tropics, being totally incapable of sustaining the cold. They are easily tamed and familiarized, and several species have been brought to England, where fruits, fish, and flesh have been promiscuously devoured by them with considerable voracity. Whatever was received by the bill was thrown into the air, and on its return caught, and, without the slightest mastication, instantly devoured. There are seventeen species enumerated by Gmelin, though Mr. Latham mentions only fifteen.

Species.

**Viridis**; Green Toucan. Green, with a yellow belly, and red rump. This species is found in Cayenne, and is about fourteen inches long. The upper mandible is yellow, with red sides, and a black line in the middle; the lower one is black, the base and round the nostrils are red; the teeth in both are white; the irides and naked orbits are yellow; the legs are of a lead colour; the claws are black; the tail is wedged, beneath inclining to ash; head, chin, and throat, in the male black, in the female bay, terminated by a black narrow transverse band.

**Edentulus**; Toothless Toucan. In this the bill is not serrated at the edges. It inhabits Cayenne, and is twelve inches long. The upper part of the body is green, but beneath it is more of a yellowish colour; the head and neck are chestnut; the rump is red; the upper mandible is brown, the lower black; the thighs green, and it is thought to be a variety of the viridis.

**Pavonicus**; Pavonian Toucan. The general colour of this is green, but the feathers are sprinkled with red spots. It is also known by a mixture of red and changeable or peacock-coloured feathers interpersed. The bill is variegated yellow and black; the legs and claws are black.

**Piperivorus**; Piperine Toucan. Green; the fore parts are black; the vent and thighs red. This species has been described by Edwards under the name of the green toucan. Its length is about seventeen inches, and its general colour is of a dull green; the head, neck, and breast, are of a deep black; behind each ear is a somewhat lengthened orange-coloured spot, and immediately behind the lower part of the neck is an orange-coloured bar or collar; the belly is pale and yellowish-green; the thighs are purple; the vent is red, and the tail, which is coarsely crested, slightly tipped with dull red; the bill is about three inches long, and of a black colour, but towards the base it is variegated by red, white, and orange-yellow. In the female the head, neck, and breast, are brown instead of black, and the lower part of the belly is grey. It is a native of Cayenne, and fed to feed on the pepper of the country. The female of this species has been known to vary in having the bill of a horn colour, with a black bar near the end, and two others near the edge; the ridge also being black, and the yellow crescent at the neck is wanting.

**Aracari**. This species is green, but the abdominal band, vent, and rump, are red; the belly and breast are yellow. It is a native of Brazil, Surinam, and Cayenne, and is full sixteen inches long. The upper mandible is black on the back and tip, but the sides are whitish. The base is three-lobed at the nostrils, with a white arch at the root, lower black; the head, wings, and tail, are black; the breast and body are yellow and scarlet, with a black roundish spot in the middle of the breast, and a similar transverse one on the beginning of the belly; the thighs are tawny.

**Torquatus**; Collared Toucan. This bird is black above, and beneath it is whitish; the belly is green, the hind part is red, and the collar red. It inhabits the coasts of New Spain, is about eighteen inches long, and feeds on fish. The upper mandible is blackish, and the lower black; the irides are of a reddish-yellow; the head and neck are black; the lower tail-coverts are red; the thighs purplish; the legs are of a greenish-ash colour; the claws are black.

**Piscivorus**; Brazil Toucan. This is blackish, but the abdominal band and vent are red; the rump is white. It inhabits South America, and is twenty-one inches long. The bill is yellow, with a scarlet spot on the tip; the lower mandible is blue; the eye, back, wings, tail, belly, and thighs, are black; the temples, chin, breast, and rump, are white.

**Erythropterygion**; Red-breasted Toucan. Blackish; the cheeks, chin, and throat, white; upper tail-coverts sulphur, but the lower and crescent on the breast are red. This is found
found in various parts of South America. The beak and back of the bill are yellow; tip of the upper mandible, and hollow of the lower, red; the nostrils are edged with black; the orbits are blueish; the legs are plumbeous, and the claws are black.

**Tucan;** Yellow-breasted Toucan. This is also blackish; the abdominal band, vent, and rump, yellow. It measures about nineteen inches in length, and has been described by Mr. Edwards from a living specimen brought into England. According to this gentleman, the bill of this species is large in proportion to the size of the bird; it is compressed sideway, having a sharp ridge along its upper part, and toothed on its edges; the upper mandible is green, with a long triangular spot of orange colour on each side, and the ridge on the upper part yellow; the lower mandible is blue, with a shade of green in the middle; the point is red; it has about five transverse faint dully bars, which cross the joinings of the two mandibles; the nostrils are invisible in the black line that surrounds the bill; the iris of the eye is of a fair green colour; round the eye is a broad space of naked skin, of a violet colour; the skin beneath the feathers is of a violet colour, below which is a bar of scarlet feathers, which parts the yellow on the breast from the black on the belly; the covert-feathers of the tail are white above, and those beneath are of a fine red; the crown of the head, upper part of the neck, the back, wings, belly, and tail, wholly black, though on the upper side of the wings and tail it has a changeable gloss of bluish-purple; the legs and feet are all of a blue or violet colour. The specimen from which this description was made, was brought from Jamaica, but the bird is a native of the hotter parts of South America.

**Picatus;** Preacher Toucan. Blackish; breast yellow, vent and tips of the tail-feathers red, rump black. It inhabits Guiana and Brazil, and is more than twenty inches long. The bill is yellowish-green, tippet with reddish; the belly is red; the tail is dotted with red at the tip. This bird is said to have a frequent habit of moving its head from side to side, while uttering its notes; hence it has obtained the name of preacher.

**Dicolores;** Yellow-throated Toucan. Blackish; breast, belly, vent, and rump, red; the chin is yellow. It inhabits Cayenne, and is seventeen inches long. The bill is olive, with a black base; the mandibles are edged with red; the cheeks are of a sulphur colour; the throat is orange, but edged with sulphur.

**Toco;** White-throated Toucan. Blackish; chin, throat, and rump, white; orbits, circle on the breast, and vent, red. It inhabits Cayenne, and is about nine or ten inches long. The bill is of a reddish-yellow, the face is black; the upper mandible is black at the tip.

**Indicus;** Indian Toucan. The throat, quill-feathers, and tail, black; the cheeks and breast are white; belly and thighs are yellow; the crown is of a reddish-orange; rump crimson. It is found in divers parts of India. The bill is hardly serrate, and not so large as in the others.

**Luteus;** Yellow Toucan. This is of a yellowish-white; the neck is marked with two black lateral stripes; the tail and wings are variegated with black and white; the upper wing-coverts are yellow. It inhabits New Spain, and is about the size of a pigeon. The beak is black; the irides are yellow; the legs are brown; the claws are yellowish.

**Ceruleus;** Blue Toucan. Blue mixed with cinereous. It inhabits the coasts of New Spain. The bill is longer than the body; the eyes are black and the irides are tawny.

**Durius;** This is the blue-throated toucan of Mr. Latham, described from a catalogue of the museum of baron Fangere of Montpellier, where it is announced as an undescribed species.

**Albus;** White Toucan. This is entirely white.

**Rampicherla;** in Geography, a town of Hindoostan, in the circuit of Guntoo; 12 miles N.E. of Innakonda.

**Rampin, in the Mangs. See Toe.**

**Rampion, in Botany. See Rappulus, of which Dr. Johnson supposes it a corruption. See also Phytrea.**

**Rampion, Cerebellum, a species of the campanula; which fee.**

**Rampion with feabious heads. See Jasione.**

**Rampour, in Geography, a town of Bengal; 13 miles N. of Currackpore.—Allo, a town of Hindooftan, in Bahar; 31 miles N.W. of Bettiah.—Allo, a town of Almora; 30 miles N.N.W. of Bareilly. N. lat. 28° 45' E. long. 79° 22'.—Allo, a town of Hindooftan, in Oude, on the Ganges; 34 miles N.W. of Manickpore.—Allo, a town of Hindooftan, in Oude, on an island formed by the divided stream of the Dower; 35 miles N.E. of Lucknow.—Allo, a town of Hindooftan, in Oude; 25 miles E.S.E. of Goorackpore.—Allo, a town of Hindooftan, in Oude; 30 miles N.E. of Goorackpore.—Allo, a town of Hindooftan, in the Carnatic; 30 miles S.W. of Nellore.—Allo, a town of Hindooftan, in the circuit of Bagguland; 20 miles W. of Rewah.—Allo, a town of Hindooftan, in Behar; 22 miles N.W. of Bidizigur.—Allo, a town of Hindooftan, in the circuit of Schurunpore; 23 miles S.S.W. of Schurunpore.—Allo, a town of Hindooftan, in the circuit of Oudipour; 40 miles E.N.E. of Oudipour.

**Ramps, in Fortification, are gentle slopes made for the cannon to be drawn up and down by, and also for the easy communication of the troops posted in a battery that is raised above the level of the ground on which it is built. The rife of these slopes is about two inches, on twelve of a base, or the length of the ramp's base is six times the height, and this is general for the draught of carriages; but footways need not be of so gentle a slope, as a rife in one foot in three may answer the purpose; or, instead of ramps, stairs may be, and commonly are, used for the passage of the foot. The breadth of a carriage ramp is usually about nine or ten feet, that breadth being sufficient both for the carriage and footway; but those for foot-passage only need not be above three or four feet wide. Ramps may either rise on the side of an elevated work, or against a faulant angle of that work, or on each side of an entering angle.**

**Ramquilla, in Geography, a town of Sweden, in the province of Smaland; 5 miles N.W. of Calmar.**

**Ramsay, Allan, in Biography, a poet of considerable celebrity, who wrote in the Scottish dialect, was born in the year 1686, in the parish of Crawford, Lanarkshire. He received no other education than that of the parish school, and was apprenticed to a barber in Edinburgh. It has not been ascertained when he first began to make verses; but about the year 1735, several of his poems had been published. Soon after this he laid aside the trade to which he had been brought up, and adopted the more congenial one of a bookseller. In 1721 his detached poems were published, by subscription, in a quarto volume. In 1724 he began to publish his collection of songs, entitled “The Tea-table Mischellany,” which at length extended to four volumes. This work was followed by one, entitled “The Evergreen,” being a collection of songs written by the ingenious before the year 1600. These publications were well received; but his fame was greatly extended by his**

"Gentle
"Gentle Shepherd," which was afterwards enlarged from two pastoral poems, in the form of a regular drama. He now held a correspondence with several poets and other ingenious persons of the time, and his shop in Edinburgh was the resort of the men of letters who then flourished in the capital of Scotland. He is supposed to have opened the first circulating library in that city, and in 1736 he built a play-house, which was the first ever known in Edinburgh; but the act prohibiting the exhibition of plays in unlicensed buildings, caused it to be shut up. Ramfay, towards the middle of his life, withdrew from the field of authorship, and attended to the much more profitable buffets of selling, rather than writing of books. He died in 1758, at the age of 71. The poems of Allan Ramfay, says an eminent critic, "display none of the fire of the genius so conspicuous in those of Burns, but have occasionally an agreeable pastoral simplicity, and are often marked with a vein of humour, natural, though coarse. The Gentle Shepherd is, perhaps, one of the best pastorals with respect to the pictures of real life, which are drawn with great propriety, and generally present pleasing images."

Ramsay, Allan, son of the preceding, was born at Edinburgh about 1700, and having devoted himself to painting, went at an early period of his life to study in Italy, and there received instructions from Solomon and Imperiale. After his return, he practised in Edinburgh for some time, but afterwards removed to London, and by the influence of his countryman, the earl of Bute, was introduced into the vortex of the court, painted the prince of Wales, and on the death of Shaksleton in 1767, was appointed principal painter to the crown; although Reynolds was then in possession of the highest reputation.

Ramfay never ventured to attempt the higher walks of the art, but confined himself solely to portraits, which he painted agreeably. Notpossessed of brilliancy of genius sufficient to attempt strong character, with striking effects in his pictures, he contented himself with that portion of art which meets the expectations of common observers; never offending with affectation or neglect, he finished his pictures with care and neatness, and retained his friends and reputation till he ceased to practice. He was so far attached to his art, that he visited Italy four times: to what purpose does not appear, unless it were to derive benefit from the portraits of Pompeo Battoni; for no traces of higher character are observable in his productions. Yet he was a man of found sense and strong understanding; possessed of literary acquirements, and devoted to study. Though he understood the Latin, French, and Italian languages, he was not satisfied till he added a knowledge of the Greek, acquired when he was advanced in life. Thus endowed, he was emulous of literary fame, and published, under the title of "The Inveiglator," Essays on RIDDLE, as the text of truth, on the Naturalization of Foreigners, on Taste, &c.; and, as occasion prompted, the town was favoured by him with some fugitive pieces on the politics of the day. He was always held to be highly estimable as a man, and enjoyed his fame and good fortune to about the advanced age of 75.

Ramsay, Andrew Michael, called the chevalier Ramfay, was born at Ayr, in Scotland. He received a good education at Edinburgh, where he distinguished himself so much, that he was chosen to attend the son of the earl of Wemyys at St. Andrew's. After this he went to Leyden, with the view to farther improvement, where he became acquainted with Poiret, one of the leaders of the Quietists, some of whose doctrines he imbibed. He next went on a visit to the celebrated Fenelon, archbishop of Cambray, who converted him to the Roman Catholic religion, and Ramfey ever after this considered himself as the disciple of that excellent prelate. Upon his works he formed his literary taste, and he even adopted France for his country, and made use of its language in his writings. Here he obtained some polls of honour and emolument, and he was made knight of the order of St. Lazarus, whence he had the title of chevalier. His reputation caused him to be invited to Rome by the Pretender, in order that he might undertake the care and education of his children. This he accepted; but having found that little court so divided by factions, he quickly resigned his office, and returned to Paris. In the next year, 1725, he revisited his native country, and resided some years with the duke of Argyle, employing himself in the composition of several works. After his return to France, he entered into the service of the prince of Turenne, duke of Bonfilon. He died in 1745, at St. German-en-Laye, the retreat of the exiled Stuart family, at the age of 57. His principal writings were, "L'Histoire de la Vie et des Ouvrages de M. de Fenelon," "Essai sur le Gouvernement Civil," "Dixours sur le Poème Epicque?" "Le Physiocrate," being remarks on lord Shaftsbury's Characteristic; "L'Histoire du Marechal de Turenne," and "Les Voyages de Cyrus." The last is that which is by much the best known, and it has been frequently printed in the French and English languages. Voltaire has styled it a feeble imitation of Telemae; it is, however, written with elegance, but is tedious. Another of the chevalier's works was "A Dissertation on Free-Masonry," of which he was grand chancellor in France. In this he traces the origin of the institution to Palestine, in the time of the Crusades; and having found a great declension of the mystical ceremonies formerly practised, he strongly urged their renewal, and proposed a general assembly of the brotherhood of all nations to be held at Paris. Biog. Brit.

Ramsay, in Geography. See Ramsay.

Ramsay Point, a cape on the S.E. coast of the island of Lewis. N. lat. 57° 44'. W. long. 6° 36'.

Ramsbury, a village and parish in the hundred of Ramsbury, and county of Wilts, England, is situated about six miles to the eastward of the town of Marlborough, and 70 miles west by south from London. In the time of the Saxons it was a place of much importance, as to be constituted the seat of the king, when Wiltshire was made a distinct bishopric by Plegmund, archbishop of Canterbury, in the year 1009. Ramsbury church was then the cathedral church of the dioceze, and continued to be so till bishop Herman prevailed upon king William the Conqueror to unite the bishoprics of Wiltshire and Sherborne, and fixed his episcopal seat at Old Sarum. The church, an ancient building, is divided into a nave, two aisles, and a chancel, with a massive square tower at its western extremity. In the chancel is a long stone, which tradition affirms to be the grave-stone of a giant; also an old altar tomb of Purbeck marble, without any inscription, and several monuments commemorative of the Jonefs of Ramsbury manor, or park. This seat is now the property of Sir Francis Burdett, bart., in right of his mother, second daughter of the late William Jones, esq. The house was designed in the Greek style, by John Webb, nephew to Inigo Jones. The inclines are extensive and well wooded, and are intersected by a branch of the river Kennet, which spreads itself out in the form of a lake, from the sides of which the grounds rise in easy, sloping lawns.

Littletocot park, the seat of major-general Edward Leybourne
Ramsden, Jesse, in Biography, an eminent English mathematical and astronomical instrument-maker, the son of an inn-keeper at Salterhebble, near Halifax, in Yorkshire, where he was born in the year 1735. At nine years of age he was admitted into the Halifax free-school, where he acquired, during three years, the elements of classical learning; after which he was removed to the care of an uncle at Craven, by whom he was sent to a clergyman of the name of Hall, who had acquired much reputation by teaching at his school the mathematical sciences. Under this gentleman's instructions, young Ramsden became a proficient in geometry and algebra, and was advancing rapidly in these and other collateral branches of study when his father sent him to London, to apprentice him out with a clothier at Halifax. At the age of twenty he went to London, where he became clerk in a wholesale cloth warehouse. This situation he retained about two years and a half, when his inclination for the sciences revived so strongly, that he resolved to qualify himself for some business which should prove suitable to the bent of his mind. With this view he bound himself apprentice for four years to Mr. Burton in the Strand, who was esteemed one of the best workmen of his time in making thermometers and barometers, and in engraving and dividing mathematical instruments. After the expiration of his apprenticeship, he worked as journeyman with a fellow of the name of Cole, with whom he afterwards associated himself as partner. This connexion did not last long, when Mr. Ramsden opened a workshop on his own account, in which he soon recommended himself to the employment of the principal mathematical instrument-makers in London. In the course of his business his repeated examination of the instruments which were sent him to be engraved or divided, led him to discover their defects, and his genius suggested to him the means of removing them, or of correcting better instruments. In order to put his plan into execution, he made himself master of the practical operations of the trade, and formed the design of examining every astronomical instrument in use, with the view of correcting those which, being founded on good principles, were faulty only in the construction, and of prescribing those which were defective in both their respects. About this time, by his marriage with Miss Dollond, he became possessed of a part of Mr. Dollond's patent for achromatic telescopes. In the year 1766, Mr. Ramsden opened a shop in the Haymarket, where he continued till 1774, when he removed to Piccadilly, where he remained till the time of his death. Before his settlement in the Haymarket, he had improved the sextant, and he had invented his celebrated dividing machine. (See the art. ENGINE.) Having spent ten years in bringing this machine to perfection, he obtained from the Board of Longitude a premium of 1000l. Mr. Ramsden constructed an instrument for dividing straight lines, which has been described in a former volume of the New Cyclopaedia, and while he was employed on his dividing-machine he made great improvements in several other instruments. The THEODOLITE (see the article), before his time, confined merely to a telescope, turning on a circle, divided at every three minutes, by means of a VERNIER, which he; but in the hands of Mr. Ramsden it became a new and perfect instrument, serving for measuring heights and distances, as well as taking angles. The largest and most perfect theodolite ever constructed was made by him for general Roy, for the purpose of measuring the series of triangles in England. Though this instrument is only of eighteen inches radius, its accuracy is so great as not to admit of an error of a single second. With this instrument general Roy measured the angle between the polar star and the sides of his triangles, in order to have the exact difference between the observations of Paris and Greenwich, which he found to be 30°. Mr. Ramsden was a great improver of the barometer for measuring the height of mountains, which he could obtain to a degree of accuracy that was very surprising, and he caused to be engraved a table to accompany his barometers, which, without the trouble of calculation, gives the heights of places, according to the heights of the mercury, and even at different temperatures. He also pointed
pointed out a new method and apparatus adapted to the 
conveyance and support of the portable barometer. Mr. 
Ramsden made improvements on the electrical machine; 
and on manometers for measuring the density of the air; he 
vented an instrument for measuring inaccessible distances; 
laying balances which turn with less than a ten-thousandth 
part of the weight used; levels and a variety of other in-
struments. The pyrometer also exercised his talents, and 
on this occasion, as on all others, Mr. Ramsden showed a 
fort of natural and almost intuitive faculty in discovering 
the essential faults of an instrument, and in inventing the 
most simple and exact methods of correcting them. With 
respect to optics, he discovered a method of correcting, in 
a new and perfect manner, the aberration of sphericity and 
refrangibility in compound eye-glasses applied to all astro-
nomical instruments. Opticians had imagined that the purpose 
might be accomplished by making the images of the object-
glases fall between the two eye-glasses, which was attended 
with this great inconvenience, that the eye-glasses could not 
be touched without deranging the line of collimation, and 
the value of the parts of the micrometer. To remedy this 
inconvenience, he let out from a simple experiment, viz. that 
the edges of an image observed through a prism are less 
 coloured, according as the image is nearer the prism. This 
led him to attempt placing the two eye-glasses between the 
image of the object-glasses and the eye, without falling to 
correct the two aberrations; which he did by changing the 
radii of the curves, and placing the glasses in a manner very 
different from that commonly employed. In the Philoso-
phical Transactions for the year 1779, Mr. Ramsden has 
described a new reflecting object-glasses micrometer; to the 
paper on this subject we refer our readers, and also to the 
article Micrometer in this Dictionary. With this micro-
 meter the diameters of the planets may be measured; it 
may be adapted to all kinds of achromatic telescopes; it 
may be brought near to, or removed from, the object-glasses 
at pleasure, to render vision distinct; and it may be removed 
from the telescopes, if the observer wish to use the latter 
without a micrometer. The high degree of merit to which 
Mr. Ramsden's many and important inventions were intituled, 
led his friends to propose him as a member of the Royal 
Society, and he was elected in the year 1786.

The Equatorial or Transit instrument (see the articles) re-
ceived great improvements in the hands of Mr. Ramsden, 
who rejected the endless screw, which by preying on the 
centre destroyed its precision; he placed the centre of grav-
ity on the centre of the base, and caused all the movements 
to take place in every direction; he pointed out the means 
of rectifying the instrument in all its parts, and he applied 
it a very ingenious small machine, for measuring or cor-
recting the effect of refraction. The greatest equatorial in-
strument ever attempted, is that which he constructed for Sir 
George Shuckburg, on which he employed several years, 
and of which we have given a description and figure. Mr. 
Ramsden's meridian telescopes which he made for Blenheim, 
Manheim, Dublin, Paris, and Gotha, are also remarkable 
for the excellence of their object-glasses. With that of 
Dublin, Mr. Usher observed stars of the fourth magnitude 
in the open day, and those of the third very near their con-
junction with the sun. These telescopes are eight feet in 
length. There is a five-feet one at the observatory at Pal-
ermo. Mr. Ramsden made great improvements in the mural 
quadrant, of which a full account will be found in the article 
Circle, to which we refer our readers for much valuable 
information on the subject of astronomical instruments. 
Having in various parts of our work entered into the nature 
of Mr. Ramsden's improvements and inventions, it is unnec-
cessary to repeat here what has already been fully explained.

The field in which the inventive genius and superior talents 
of Mr. Ramsden were exercised, was, as we have seen, very 
extensive. In order that every part of his instruments might 
be fabricated under his own inspection, he collected in his 
workshops men of every branch of trade necessary for their 
construction. So important did he consider the principle 
of division of labour, that he always confined the same workmen 
to the same branch, and by that means arrived at the greatest 
correctness and nicety in executing it. Notwithstanding 
the great perfection of his instruments, which ought to have 
secured to Mr. Ramsden a large fortune, he sold them cheaper 
than any other artist in London, sometimes even one-third 
below the usual price. Such was the demand for them, 
from almost all parts of the world, that though he employed 
sixty men, he was unable to execute all the orders which he 
received. His great attention to business injured his health, 
and hallowed his death. He died at Brighton, where he 
had been for the benefit of the sea-air, November 5, 1800, 
in the sixty-sixth year of his age. He had been elected a 
member of the Imperial Academy of Sciences at Petersburg 
in 1794, and in the following year he was presented with the 
gold medal, adjudged by the Royal Society to persons dis-
tinguished for their scientific talents.

Mr. Ramsden was by nature endowed with uncommonly 
strong reasoning powers, and a most accurate and retentive 
memory, but, at the same time, with such a quickness of 
penetration, that he could, as it were, with a single glance, 
view in every light the subject on which he thought, and 
adopt the most advantageous mode of considering it. He 
polished, in an exquisite degree, that quality of mind 
which is emphatically styled elegance, which in the abstract 
sciences leads to clearness, simplicity, and precision, as in 
the fine arts and literature, it gives the last polish to genius, 
and is more generally known by the appellation of talent. In 
his habits he was temperate to abstinence, satisfied with 
small quantities of food, and a small portion of sleep. Un-
acquainted with dissipations or amusements, and giving but 
little time even to the society of his friends, the whole of 
those hours which he could spare from the duties of his pro-
fession, he devoted either to further improvements in his in-
struments, or to perusing books of science, particularly 
those mathematical works of the sublime writers which had 
any connection with the subject of his own pursuits. Mr. 
Ramsden's only relaxation from almost constant and severe 
studies, was the occasional perusal of the best authors, 
both in prose and verse; and when it is recollected that at 
an advanced age he made himself fully master of the 
French language, as to read with peculiar pleasure the 
works of Boileau and Molière, no one can believe that he 
is spent even his hours of amusement. Short and temperate 
as were his habits, a book or a pen was the constant 
companion of his meals; and when ill his broke his sleep, 
a lamp and a book were ever in readiness to beguile the 
verse of pain, and make bodily sickness minister to the 
progess of his mind. He was well skilled in the abstruser parts 
of mathematics, and conversant with the best writers on the 
sciences; and such was his manual dexterity, that there was 
not one tool in any of the numerous branches of his pro-
fession which he could not use with a degree of perfection 
equal to that of the very best workmen in that particular 
branch, and he could have begun and finished every single 
part of his most complicated instruments. For this article 
we are chiefly indebted to a very elaborate and excellent ori-
numbers of sauraffes, the largest species of the crane kind, are here seen at certain seasons of the year, so that any quantity of eggs may be collected. The lake gradually narrows, and from its northern edge lends off two small brooks; and at the other extremity it discharges itself into a much larger lake. This lake, it is said, is held in high respect by the inhabitants of Boodan, whose superstition leads them to consider the increase or decrease of its waters as portentous of good or evil to their nation. They fancy it to be a favourite haunt of their chief deities. Turner's Thibet, p. 212, &c.

RAMTEAK, or RAMTECH, a town of Hindoostan, in the circle of Goondwana, held sacred by the Hindoos, who pretend that Ram collected his army here, prior to his expedition against Ravan at Lanka, or Ceylon. The Hindoos believe all the Europeans to have descended from Ravan, and Ceylon to be an immense mountain of gold invisible to them. Near the town is a temple, in which they offer up their facrifices and devotions; 15 miles N.E. of Nagpore. N. lat. 21° 29'. E. long. 79° 57'.

RAMTRUT, in Mythology, the name of a deity worshiped by the Kariazes, a people of Hindoostan, whom he has a celebrated temple, at Onor. The characters under which he is represented more resemble those of a monkey than of a man.

RAMULOSE LEAF, in Botany. See LEAF.

RAMUNDA, or ROMLA BODA, in Geography, a town of Sweden, in Nericia.

RAMURAH. See RAMUR.

RAMUS, Peter, in Biography. See RAMISTS.

Ramus, in Anatomy. This word, signifying branch, and the term ramification, are used in describing the arteries, veins, and nerves, the divisions and subdivisions of which bear some analogy to the branching of a tree. In the same way we speak of trunks of arteries, &c. and describe them as branching out.

Ramus, in the Anatomy of Plants, a name given to the first or lateral branches, which go off from the petiole, or middle rib of a leaf. The subdivisions of these are called furculi; and the final divisions of these into the most minute of all, are by some called capillamenta; but in general, both these kinds are comprehended under the name of furcula.

RAMUSIO, or RAMUSIUS, GIAMBATTISTA, in Biography, an early collector of voyages and travels, the son of Paolo, an eminent lawyer, defended from a learned and distinguished family of Venetian citizens, was born at Venice in 1485. He was in early life deputed by the flate upon public business to Switzerland, Rome, and France; and in the latter country he so much ingratiated himself with Lewis XII., that he was by him caused to travel through almost the whole of his kingdom. As a reward for his services, he was made secretary of the council of ten at Venice, which post he at length resigned; and returning to Padua, employed himself in compiling his great work, “Raccolta delle Navigazioni e de Viaggi,” which was published at different periods between the years 1554 and 1559, in three volumes folio. He had prepared a fourth volume, which was burnt at the printer's. Ramusio died at Padua in 1557; of course, a part of his work was given to the world after his decease. Ramusio was author of a treatise "De Nili Incremento." He was a man of great learning, and was extremely conversant in history, geography, and the ancient languages: he had some knowledge in alchemy, and held a correspondence with many learned men and well informed persons, both in Italy and Spain. It was by their assistance, and at the desire of Tracaltorso, that he composed
the work already mentioned. This work was a collection of all the voyages and travels that had hitherto been published; in which he gave translations of those in foreign languages; and he prefixed dissertations, in which he diligently examined the pretensions of different authors, comparing them with one another.

RAN, in our Old Writers, is used for open and public robbery, so manifest that it cannot be denied. "Ran dicitur aperta rapina que negari non potest." Lamb. 125. Leg. Canut. cap. 58. Hence it is to this day vulgarly said of one who takes the goods of another injuriously and violently, that he has taken or finchted all he could rap and ran.

RAN, twenty cords of twine, wound on a reel; and every cord so parted by a knot, as to be easily separated.

RANA, in Geography, a town of Austria; 12 miles S. of Aigen.—Alfo, a town of Austria; 13 miles S.S.W. of Zwettl.

RANA, or Oranoo, one of the Sandwich islands, in the North Pacific ocean, situated about three leagues from Mowee and Morotoi, and lying to the S.W. of the passage between these islands. The country to the south is high and craggy; but the other parts of the island had a better aspect, and appeared to be well inhabited. It produces very few plantains, and bread-fruit trees; but abounds in roots, such as yams, sweet potatoes, and tarro. The number of inhabitants is estimated at 20,400. Its S. point is in lat. 20° 45'. E. long. 203° 8'. Cook's Third Voyage, vol. iii.

RANA, in Surgery. See Ranula.

RANA, in Zoology. The frog, a genus of the class Amphi-bia, of the division Reptiles, of which the generic character is: Body four-footed, naked; it generally has no tail, the hind legs are longer than the fore. This genus differs from the Lacerta (see the art. Lizard), in having a shorter body, broader, thicker head, and in general no tail. The animals of it feed on insects; they are full grown about the fourth year, and seldom live beyond the twelfth. Their fore-feet are more frequently, having four toes: their hind-feet are palmate and five-toed; they are extremely paddling to the female for days and weeks: the tadpole is excluded from the egg without feet, but with a tail resembling a fish's, which drops off as the legs are protruded; in this state they have likewise a sort of gills and lungs, and many have a small tube on the lower lip, by which they can affix themselves to other bodies; near the light eye is a vesicle, from which they discharge water: in breeding time, the fore-thumb of the male is warty: toads, as we all know, are filthy in their aspect, and live in damp, obfene, dark places, and crawl out only by night: their eggs are in a long chain: frogs are more active, and more about by day: these lay their eggs in a confuted maze.

Dr. Shaw, in his entertaining and instructive Zoology, says this genus may be divided into three sections; viz. 1. Frogs, commonly called Rana, with light active bodies, and which leap when disturbed. 2. Slender-limbed frogs, Hyla, Calamites, or Rana arborea, viz. such as have light bodies, very slender limbs, and toes terminating in flat, circularly expanded tips, enabling the animal to adhere at pleasure to the surface even of the smoothest bodies. Several of this division actually reside on trees, adhering by their toes to the lower surfaces of the leaves and branches. 3. Toads, Bufonae, or such as have heavy bodies, short thick limbs, and which rather crawl than leap when disturbed.

Gmelin has given a different arrangement, which, according to our usual custom, we shall follow in this article. He divides the genus into three sections, viz. A, those with warty and pulped up bodies; and short legs; these are toads. B, those with bodies rather oblong, smooth and with longer legs: these are frogs, properly so called. And C, whose hind feet are very long; and whose claws are lenticulate. Dr. Shaw enumerates more than fifty species, but Gmelin describes only thirty-six.

Section A.—Body warty, pulped up: shorter Legs.

Species.

PIPA; Surinam Toad. The toes of the fore-feet of this species are unarmed, four-clawed; those of the hind-feet are clawed and palmate.

This hideous and deformed animal inhabits the waters of Guiana, and is actually eaten by the natives. The male, after the exclusion of the eggs, collects the mafs together, and finears it over the back of the females with its paws, where they are received into small cells, impregnated by the males and closed up; after some time the perfect young are excluded from these hollow tubercles on the back of the female.

The size of the Pipa considerably exceeds that of the common toad; the head is flat, broad, and very short; the back is flatula-shaped; the eyes very small and remote; neck very short, wrinkled; the body is orbicular, flat, with a hard cartilaginous skin; the fore toes are round, and the hind ones very long, connected by an undivided membrane. This species was first made known to the Europeans about the latter end of the 17th century.

MUSICA; Musical Toad. The specific character of this is, that it has gibbous shoulders that are dotted; the body is varied with lurid and brown; the fore-feet are cleft, and the hind-feet are subpalmate and five-toed, with fearcely any claws. It inhabits the fresh waters of Surinam: it is larger than the common toad: in the evening, and during the whole night, it keeps up a continual musical kind of croaking; hence it takes its name.

*Boro; Common Toad. Body lurid and brown: of this animal there are three varieties, as follows: the first has its back of an olive colour; and an unequal yellowish-red band down the side: the body of the second is marked with confluent green spots and warts on the spots of the same colour, those of the intervals red, the spaces between bicoloured. The third is particularly distinguished for its size, being much less than the others. This of all the European toads seems to be the most universally known. It is found in flady places, in gardens, woods, and fields, and frequently makes its way into cellars, or any obscure recesses in which it may occasionally conceal itself, and where it may find a supply of food, or a security from too great a degree of cold. In the early part of spring, like other of this genus, it retires to the waters, where it continues during the breeding season, and deposits its ova or spawn in the form of double necklace-like chains or flings of beautifully transparent gluten, and of the length of three or four feet, in each of which are disposed the ova in a continued double series throughout the whole length, having the appearance of so many small jet-black globules or beads; being in reality no other than the tadpoles or larvae convoluted into a globular form, and waiting for the period of their evolution, or hatching, which takes place in the space of about fourteen or fifteen days, when they break from the surrounding gluten, and like the tadpoles of frogs, swim about in the water, and are nourished by various animalcula, gluten, leaves of water-plants, &c. &c. till, having arrived at their full growth, the legs are formed, the tail gradually
gradually becomes obliterated, and the animals leave the
water, and betake themselves to the surface of the ground.
This generally happens early in the autumn, at which period
it is not uncommon to find such numbers of the young ani-
mals in some particular places, that their appearance has fre-
cently given rise to the vulgar idea of their having been
flowered from the clouds.

The toad is an animal too well known to require any very
particular description of its form. It may be necessary to
observe, that it is always covered by tubercles, or eleva-
tions on the skin, of larger or smaller size in different in-
dividuals, and that the general colour of the animal is an
obscure brown above, much paler and irregularly spotted
beneath. The toad, however, is occasionally found of an
olive cast, with darker variegations; and in some speci-
mens, more especially in the earliest part of summer, the
shoulders and limbs are marked with reddish spots, while a
tinge of yellow often pervades the under parts both of the
limbs and body.

The toad arrives at a considerable age; its general term
of life being supposed to extend to fifteen, or even twenty
years; and Mr. Pennant, in his British Zoology, gives us
a curious account, communicated by Mr. Arscott, of Teholt,
in Devonshire, of a toad’s having lived, in a kind of do-
matic flat, for the space of more than forty years, and
of having been, in a great degree, tamed, or reclaimed from
its natural fihness or desire of concealment; since it would
always regularly come out of its hole at the approach of its
mater, &c. in order to be fed. It grew to a very large
size, and was considered as fo singular a curiosity, that even
ladies, laying aside their usual aversion and prejudices, re-
quelled to fee the favourite toad. It was, therefore, often
brought to table, and fed with various infects, which it
feizd with great avidity, and without seeming to be em-
barrased by the presence of company. This extraordinary
animal generally refided in a hole beneath the steps of the
house door, fronting the garden; and mighthave probably
survived many years longer, had it not been severely
wounded by a raven, which feizd it before it could take
refuge in its hole, and notwithstanding it was liberated
from its captor, it never again enjoyed its usual health,
though it continued to live above a year after the accident
happened.

The toad is looked upon with great aversion by the major
part of mankind; and it must be confessed, that its appearance
is disgusting, yet the eyes are remarkably beautiful, being
surrounded by a reddish gold-coloured iris, the pupil, when
in a state of contraction, appearing translucent.

We shall conclude the history of this animal, with mention-
ing the extraordinary circumstance of its having been
occasionally discovered inclosed, or imbedded, without
any visible outlet, or even any passage for air, in the sub-
flance of wood, and even in that of flone or blocks of marble.

“Foy my own part,” says Dr. Shaw, “I have no hesitation
in avowing a very high degree of scepticism as to these sup-
pofed facts, and in expressing my suspicions that proper
attention, in such cases, was not paid to the real situation
of the animal. That a toad may have occasionally latubilized
in some part of a tree, and have been in some degree over-
taken or inclosed by the growth of the wood, so as to be
obliged to continue in that situation, without being able to
efiect its escape, may perhaps be granted: but it would
probably continue to live so long only as there remained
a passage for air, and for the infest of insects, &c. on
which it might occasionally feed; but that it should be
completely blocked up in any kind of flone or marble, with-
out either food or air, appears entirely incredible, and the
general run of such accounts must be received with a great
many grains of allowance for the natural love of the marvell-
ous, the surprize excited by the sudden appearance of the
animal in an unfeeked place, and the consequent neglect
of minute attention at the moment, to the surrounding parts
of the spot where it was disovered.”

* Rubeta ; The Natter Jack. Of this the vent is ob-
tufe; and it has a yellow line on the back; the body beneath
is spotted with black, but above it is of a dirty yellow,
clouded with brown, and covered with porous pimpls of
unequal sizes. This species frequents dry and sandy places,
and is found on Putney Common, and near Reevetby-Abbey
in Lincolnshire, where it derives its trivial name. It never
leaps, neither does it curl, with the flow pace of a toad,
but its motion is more like running. Several are frequently
found together, and like others of the genus they appear in
the evening.

Gibbosa; Gibbous Toad. Body oval, convex, with a
longitudinal cicereous dentate band. A variety has its back
marbled with red and yellowish-afh; the belly is yellow,
spotted with black. The skin is found in divers parts of
India, the second at Surinam.

Bombina; Laughing Toad. Belly orange, spotted with
sky-blue; the pupil is triangular. Gmelin gives three var-
ties of this species; viz. 1. That which is dijinguished
with a black belly, marked with clear white spots and points.
2. One which is brown with white spots; the fides and
round the joints are red. 3. One which is dijinguished for
its loud fonorous voice. It is found in the fenny parts of
Germany and Helvetia; leaps like a frog; emits a clear
sound like a man laughing: it a good deal resembles the
common toad, but is small, black, and every where rough, with
dots on the upper part, and variegated beneath, with tran-
verse wrinkles under the neck.

Salsa; Salt Toad. Above of a dirty olive colour, but
beneath it is white, spotted with black. This species is found
in the flagrant waters of Berchtesgad, and is less than the
R. arboris, hereafter to be noticed; it avoids the night, is
inodorous, and emits no liquid from its minute perforated
warts: the legs are marked with brown bands, beneath it is
yellow.

Ventricosa; Tumbid Toad. The mouth of this is semi-
oxvate, and the throat ovate. A variety is marked with pale
white papules. It is found in South America, and in some
parts of India. The body is brown and orbicular; the tu-
bercles on the top of the neck longitudinally dijofed; the
back has three longitudinal wrinkles; the flanks are tumid
and dilated.

Marina; Marine Toad. Shoulders tumid; eye-lids
warty, concheate; the hind feet are subpalmate; there is a
variety, which is spotted with brown; beneath it is fhaded
with livid, the neck and shoulders are spotted with grey.
This is found in various parts of America, and is more than
six inches long. Its body is yellowish-grey, with a few
rather tawny spots: the warts are distinguised with an ele-
vated bay flop in the middle: the protuberances of the
shoulders are oval, smooth, and porous; the vent is sur-
rounded with wrinkled radii; the hind toes are connected
only as far as the first joint, the tail joint is fringed with a
bay membrane.

Brasilienisis; Brafil Toad. Yellowish-afh, with red
waved fpop, beneath fmoother.

Aruncus; Chili Toad. All the feet of this species are
palmate. It inhabits, as its name imports, the waters of
Chili: in its fize it resembles the R. temporaria defcribed
below: on the hind toes there is a flight appearance of
claws.

Lutea ;
Lutea; Yellow Toad. The body of this is yellow; all the feet are subpalmate. This is also found in Chili; and much resembles, in its habits, the R. ecuentalus, but is much less; the half joints of the toes are not connected.

Margaritipera; Pearled Toad. Body brown-red, sprinkled with pale red spots.

Cornuta; the Horned Toad. This takes its specific name from the circumcidence of having its eye-lids horned. It inhabits Virginia and Surinam, and of the whole tribe it is the most deformed. It is said, indeed, to surpasa all animals in ugliness. It is thus described: the head is large, and rounded before; the mouth is excessively large; the eye-lids are soft, mucronate, trid at the point; the eyes are seated in the middle; the body is of a greenish-brown, with broad longitudinal whitish stripes on the back; the legs are tranversely faciate with brown; when full grown, the back, the thighs, and vent, are spiny.

Sitirunda; Defart Toad. This species character is, that above it is ash-y-glutinous, varied with blackish-green spots, beneath of a dirty white; the hind feet are semi-palmate, with the appearance of seven toes. It inhabits the dry deserts near the Ural, sometimes hides itself in holes, and crawls out in the evening; it resembles the common toad, but is somewhat larger.

Vespertina; Siberian Toad. This has a transverse spot between the eyes, forked behind, and other spots running obliquely from the eyes to the nose; the body above is cinnamon, with longitudinal subfusonulent brown spots, varied with different shades of green; beneath it is dashed with a whitish-aff. As its trivial name imports, it inhabits Siberia, and is about the size of a common toad; it leaps slowly; the head is short; the body above is sprinkled with subwarty papille.

Ribiduna; Jocular Toad. Body brown, spotted above with cinereous; the dorsal line is yellow, or greenish; beneath it is smooth, whitish; haunches brown, spotted with milk-white. The head of this species is broad; the upper eye-lid is convex, sprinkled with pores; the apertures of the ears are flat; the back is porous; the sides are marked with obfolete warts; the fore thumb is disarticuated, thick at the base; the next toe shorter than the rest; the hind limb subfaciate; the hind feet have a callus within, resembling a fith toe; the toes have a wart beneath, near the joints.

This species is found in great numbers near the rivers which empty themselves into the Caspian sea; it never ventures on the dry land; it is very large, and frequently weighs more than half a pound; it resembles the R. temporaria, but is broader and shorter; its voice in the evening is like that of a man laughing.

Variabilis; Changeable Toad. Colour variable; back and sides gibbous; warts yellowish in the centre; it is very small on the middle of the back, and larger on the most prominent part of the flanks. It inhabits the sandy places in Germany, and is only about two inches long: in its habits, it holds an intermediate place between the toad and frog; when full awake its body is white, with green spots; in the heat of the sun it is entirely cinnereous; when asleep, the spots are fairly cinnereous, and when torpid the body has a flesh-coloured cut.

The head is rounded, and the mouth without teeth; the margin of the upper jaw is doubled; the tongue is fleshy, thick, placed far back, the base obscurely bident, very entire at the tip; it has hardly any upper eye-lid, the lower one is folding; cavities of the ears white; the warts resemble teats, very numerous on the groin; the chin is marked with prominent dots; the colour, when prepared in spirits, is yellowish, and above it is of a pale olive; the fore feet are three-toed, beneath they are emarginate, the thumb is larger; the second toe of the hind feet is very long.

Section B.—Body more oblong, smooth; legs longer. Frogs.

Species.

Typhonia; Hurricane Frog. Of this species, the distinguishing characteristic is, that the lobes of the ears are oval. It inhabits America, and is said to make a noisy croaking before hurricanes and whirlwinds. The back is marked with four longitudinal wrinkles, elevated points, and black spots; the hind toes are narrow, without claws, the second is very long.

Pentadactyla; Mackarel Frog. All the legs are faciate, five-toed; body veined, the dorsal streaks transverse, the lateral ones are ocellate. There is a variety which is brown; the fore feet have four toes, with the rudiment of a fifth; the hind feet have five toes, with the rudiment of a sixth.

Ocellata; Ocellate Frog. The ears are marked with an ocellate spot; feet with claws, the hind ones sub-palmate. It inhabits America.

Pipiens; Clamorous Frog. This is green, with numerous ocellate spots, surrounded with a yellowish ring. This species is smaller than the green frog, but, in its general habits, it bears a considerable resemblance to that animal. It is a native of North America, and frequents rivulets and ditches of water, and is so strong and vigorous, that it is said it can leap to the distance of five or six yards. In the spring and beginning of summer, it is said to indicate the approach of rain by the peculiar sound which it emits. In the living animal the ears are of a shining gold colour; the region of the anus is very much wrinkled; the third toe from the thumb longer than the rest; the body resembles that of the eculent, or green frog, but the hind thighs are longer; the fanks are longer still, and hind feet are longer than these, margined on each side; the toes are connected nearly to the tip, the fourth is longer than the rest.

Bicolor; Blue and Yellow Frog. Colour blue, ochreous beneath, feet unwebbed; toes flattened and orbicular. This elegant species is of a moderate size; it measures more than four inches in length. The whole of the upper surface is of a beautiful blue, while the under parts are of a pale orange, or ochre colour. The head is large, the mouth wide, and the tip of the nose truncated. All the toes are furnished with a large orbicular tip, and beneath each of the joints there is a process or tubercle. The upper parts of the female have a deeper shade of violet than those of the male. It is supposed to be a native of Surinam.

Maxima; the Great Frog. All the feet are palmate, as well as the toes, facinate; body veined and variegated; the top of the back obliquely spotted. Bands of the legs in pairs, approximate, above confluent.

Alpina; Alpine Frog. This is entirely black, and inhabits the declivities of the mountains in Austria.

Venulosa; Veined Frog. Feet cleft; the body veined with confluent spots. It inhabits Arabia and South America.

Virginia; Virginian Frog. Cinereous, spotted with red, beneath it is yellowish; the back is five-angled, with as many stripes. It is found in Virginia.

* Temporalia; or Common Frog. The back of this is flatish and sub-angular. There is a variety, which is of a dirty olive colour, with large warty spots, the head above plain, beneath whitish; twice the size of the common frog. Both are found in this country, and the latter also in Perù; it lives, during the spring, in water, among toads, and in the summer
fummer on land, at which time it is silent; it feeds on various insects, and is the prey of ducks and cranes, croaks very much when in muddy ditches; the variety makes, by night, a noise like that of an angry man.

Of all the European species this is the most common. The general color is of an olive-brown, variegated on the upper parts of the body with irregular blackish spots. The patch beneath each eye, which reaches to the tending on of the fore-legs, seems to constitute one of the principal specific distinctions. The under part of the body is of a pale greenish colour, and obscurely spotted. But it ought to be observed, that the color of the frog varies at different seasons of the year, and perhaps in different places. Towards the end of summer, for instance, the colours are much brighter; and as this species frequently calls its skin, the cuticle falling off irregularly from different parts of the body, produces considerable variations in the intensity of the colours.

The frog has a light elegant form and a lively appearance; the limbs are well calculated for its peculiar motions, and the hind feet being strongly webbed, enable it to swim well. The frog, it is said, does not reach its full size till it is five years old, and it lives from twelve to fifteen years. It retires during the heat of summer to the water, and in winter it becomes torpid, and is generally found in the soft mud at the bottom of stagnant waters; or in the cavities beneath their banks, where it remains till the return of spring.

The frog, as well as many other of the reptile tribe, is extremely tenacious of life. It survives, for a considerable time, the loss even of some of its essential organs, and it has been found to exist for several days when entirely confined under water.

The frog deposits its spawn in the month of March. This is composed of a gelatinous transparent mass, including the ova or eggs, in each of which is imbedded the embryo or tadpole, which has then the appearance of a round black globule. The period of hatching varies according to the temperature of the season, but it is commonly in about a month or five weeks. In its progress the egg becomes gradually larger, and before the tadpole is excluded, it is seen in motion within the surrounding gelatine. When they are first hatched, their only food is the remains of the gelatine in which they were included. A few days afterwards, if they are minutely examined, a pair of ramified branchie, or temporary organs, may be observed on each side of the head, which after a short time disappear. The tadpole, which is so extremely unlike the animal in its perfect state, seems to confine only of a head and tail. The head is large, black, and roundish; the tail is slender, and margined with a broad transparent fin. The motions of the tadpole are very lively. Its food consists of duck-weed and other small water plants, with different kinds of animalcula. The mouth is furnished with very minute teeth, and when the tadpole has reached a certain size, it may sometimes be heard gnawing the edges of the leaves on which it feeds. By means of a sucker placed between the lower jaw, with which the animal in this state is furnished, it can attach itself at pleasure to the under surface of aquatic plants. When it is very young, it sometimes hangs from this part by means of a glutinous thread, similar to some small flies.

The internal structure of the organs of the tadpole is very different from that of the future animal. In no respect is this difference greater than in the disposition of the intestines, which are coiled in the form of a flat spiral, like a cable. The first change which appears on the tadpole is at the end of five or six weeks after it is hatched. It is about this time that the hind legs first appear; and gradually increasing in length and size, they are succeeded about two weeks afterwards by the fore legs. These latter, indeed, are formed at an earlier period beneath the skin, and are sometimes protruded, and again drawn back by the animal, through a small hole on each side of the breast, before their complete evolution. The tail now gradually decreases, and afterwards more rapidly, so that in the space of a day or two, it is quite obliterated. After this change, the animal leaves the water, and covers the banks in myriads. The sudden appearance of such multitudes of young frogs, has probably induced the groundlegs but popular belief, of their having fallen from the clouds in flowers. The frog having now arrived at its perfect form, it changes entirely the nature of its food. It lived formerly on vegetables, now it depends solely for its existence on animal food. It lives chiefly on small flies, worms, and insects. To seize its prey, the structure and position of the tongue are remarkably well fitted. It is of considerable length, and is attached to the fore part of the mouth; and when at rest it lies backwards. The extremity is bifid, and secretes a glutinous matter, so that in this way it can secure its prey by darting out its tongue with great celerity, and to some distance from the mouth. This it does with so instantaneous a motion, that it is scarcely perceptible to the eye.

* MARGINATA; Bordered Frog. The sides of this are marginate, and the feet cleft. It inhabits India and South America.

+ ESCULENTA; Edible, or Edible, or Green Frog. Of this species the distinguishing characteristics are, that it is of an olive colour, spotted with black, with three yellowish lines on the back; the abdomen is whitish.

Of all the European frogs this is the largest species. The general appearance is very like that of the R. temporaria, but it is larger in size, and of an olive-green colour, strongly marked on the upper part of the body with roundish black spots. The limbs are elegantly marked with transverse bands of the same colour. Three distinct pale yellow stripes run from the tip of the nose down the whole length of the back; the middle one being slightly depressed, but the two lateral ones are considerably elevated. The head is proportionally larger than that of the common frog.

The green frog is rare in England, but is very common in France, Italy, and Germany, where it is employed as an article of food.

This species, it is observed by naturalists, does not leave its winter retirement till a much later period than the common frog; and in those countries where it is used as food, it is worth while to attend to this fact: for if they are pretended to be brought to market at an earlier period, the common frog, and sometimes even toads, must be sublimated. During the breeding season, the croaking of the male is so loud, that it may be heard at a great distance; and in those places where they are numerous, it becomes so intolerable to those who are unaccustomed to hear them, that they are often deprived of sleep. At this time, too, a large infected globular vesicle is protruded from each side of the head of the male. The globules of spawn in the green frog are proportionally smaller than in the former species; they have somewhat of a yellowish cast. The prolong of the tadpole, towards the evolution of the perfect animal, is considerably flower in this species. The fore legs do not appear before October, and the animal does not assume its perfect shape till the beginning of November. The tail at this time begins to decrease, and in the space of four days entirely disappears.

This species is extremely voracious, seizing, it is said, on young
young birds of different kinds, mice, and even ducklings, and, as it does with the rest of its prey, swallowing them whole. At the end of four years it has reached its full growth. It begins to breed the year following, and the period of its life is sometimes extended to sixteen years.

**Australis**; Australian Frog. The body of this is brown above, beneath blueish; the fides are speckled with ochre colour; the toes of the fore feet are fpiny. It inhabits New Holland. The second toe of the hind foot is very long; the claws are red.

**Paradoxa; Paradoxical Frog.** This is of a yellowish and olive colour, variegated with rufous bands; the hind legs or thighs are obliquely streaked.

In its general form this species resembles the R. temporaria. The oblique longitudinal stripes on the hind legs constitute the principal mark of disftinction. There are four toes on the fore feet, and they are unwieved; the hind feet have five toes, and are deeply palamated to the very ends of the toes. Near the shortell toe there is an oblong callus, forming a spurious one. The upper jaw is becet with a row of small denticulations. This species is a native of South America, and is more common in Surinam than in other places.

Naturalists, says Dr. Shaw, have been extremely puzzled with regard to the real nature of what has been taken for the tadpole of this frog. At one time it was confidered by Linnaeus as a species of lizard, and therefore arranged by him under the genus lacerta. At another time he has placed it under the present genus, with the specific name piceus. It was described by Edwards under the denomination of the frogfish of Surinam. The structure of the animal, which has been the subjeét of so much discussion, shews clearly that it is the larva or tadpole of a frog; and it is supposed, with no small degree of probability, that the differences in the accounts given of this animal by naturalists have arisen from the different phases of its progress, in which it has been found. But as this tadpole is so much larger in size, in proportion to the perfect animal, than any other species yet known, it may be the larva or tadpole of some of the larger species, and not that of the R. paradoxa, which is but a small frog.

**C. Hind Feet very long; the Claw linear.**

**Arborea; Tree-Frog.** The body of this species is green, beneath granulate; feet cleft. Gmelin enumerates five varieties of this species. 1. Those which have four toes to their fore feet, and five to those that are behind; the knees are warty beneath. 2. Those that are of a green colour, with a yellow line on each side. 3. The body of this variety is reddish. 4. Of this it is brownish-green. 5. The slenderfes of the body marks this variety.

"In the beauty of its colours," says Dr. Shaw, "as well as in the elegance of its form, and agility of its movements, the tree-frog exceeds every other European species. It is a native of France, Germany, Italy, and many other European regions, but is not found in the British islands. Its principal residence, during the summer months, is on the upper parts of trees, where it wanders among the foliage in quest of insects, which it catches with extreme celerity; stealing softly towards its prey, in the manner of a cat towards a mouse, and, when at the proper distance, seizing it with a sudden spring, frequently more than a foot in height. It often suspends itself by its feet, or abdomen, to the upper parts of the leaves; thus continuing concealed beneath their shade. Its size is smaller than any European frog, except the R. bombina. Its colour, on the upper parts, is more or less bright in different individuals; the abdomen is whitish, and marked by numerous granules; the under surface of the limbs is reddish; and the body is marked on each side by a longitudinal blackish or violet coloured streak, separating the green of the upper parts from the white of the lower. The inferior edge of this dark lateral stripe is tinged with yellow. The body is smooth above, and moderately short or plump; the hind legs are very long and slender; the fore feet have four, and the hind feet five toes, all of which terminate in rounded, flat, and dilated tips, the under surface of which, being soft and glutinous, enables the animal to hang with perfect security from the leaves of trees. The skin of the abdomen is also admirably calculated by nature for this peculiar power of adhesion, being covered with small glandular granules, in such a manner as to fallen closely even to the most polished surface; and the animal can adhere at pleasure to that of glass, in whatever position or inclination it be placed, by merely prefling itself against it.

Though the tree-frog inhabits the woods during the summer months, yet, on the approach of winter, it retires to the waters, and there submerging itself in the rot supplemental, or concealing itself beneath the banks, remains in a state of torpidity; and again emerges in the spring, at which period it deposits its spawn in the waters, like the rest of this genus. The male at this period inflates its throat in a surprising manner, and ejects a very loud and sharp croak, which may be heard to a vast distance. The spawn is deposited about the end of April, in small clustered masses; the included globules or embryos being of a pale yellowish-brown colour. The tadpoles become perfect frogs, by the total decay of the tail, about the beginning of August; and soon begin to ascend the neighbouring trees, where they continue to reside during the remainder of the warm season; as do likewise the parent animals, after the breeding season is past. During their residence among the trees, they are observed to be particularly noisy on the approach of rain; so that they may be considered, in some measure, as a kind of living barometers; more especially the males, which, if kept in glasses, and supplied with proper food, will afford an infallible presage of the changes of weather.

**Leucophyla; White-spotted Frog.** Body smooth, hoary, with oblong milk-white spots; the fore feet are lobate, the hind feet palmate. It inhabits America, and weighs only about forty-six grains. Eyes of a fine golden colour, and between these, on the sides and middle of the back, there are oblong white spots; the humours are slender.

**Squintigera; Scaly Frog.** In this a scaly band reaches half-way round the back; the sides and throat have folds; the fore feet are semi-palmate, the hind feet are palmate. This is about two inches long, and is supposed to be an inhabitant of America. The body is varied with grey and brown in thick aggregate specks, and a few spots down the hind part of the back, in a perpendicular direction; the body consists of minute, sub-pellucid, rhomboid, imbricate scales; the hind limbs are twice as long as the fore.

**Boans; Cronking Frog.** Body smooth, with continuous dots beneath; feet palmate. There are two varieties. 1. The body above is of a blueish lead-colour. 2. The body of this is inclining to orange. It is found in America, and differs only from the tree-frog in having the feet webbed, and the body marked with white spots.

**Rana Arborea, the Tree-Frog.** See Ranunculus Vi-
ridis, and the preceding article.

**Rana Piscatoris.** See Lophius Piscatoris, and Sea-
Devil.
RANARIDIL, in Geography, a town of Austria; 11 miles S. of Aigen.

RANASAGUR, a town of Hindostan, in Bahar; 18 miles W. of Arrah. N. lat. 25° 37'. E. long. 84° 31'.

RANCAGUA, a jurisdiction of South America, in Chili. It derives its name from the inhabitants living in single houses, without the appearance of a village; every family lodging in their lonely cottage, four, six, or more leagues from each other. It is not, however, without a capital, consisting of about 50 houses, and between 50 and 60 families, most of them being Melitizos, though their cast is not perceivable by their complexion. The whole jurisdiction may contain about 1000 families, Spaniards, Melitizos, and Indians. Ulloa's Voyage, vol. ii.

RANCE, ARMAND-JOHN LE BOUTHILLIER DE, in Biography, the initiator of the order of La Trappe, was of noble descent, and born at Paris in the year 1626. At a very early period he exhibited an extraordinary genius for classical and polite learning; and at the age of 16, he had read many classical works, in the Greek as well as the Latin languages, and is said to have studied by heart during his early period to have understood Homer. When he was only 13 years of age, he prepared for the prel view a new edition of Anacreon, with notes, that displayed considerable talent and research. This was published in 1639. Four years previously to this, he had received the clerical tonsure, and had been nominated a canon of Notre Dame at Paris. He was permitted to receive the king to the sinecure priory of Boulogne, near Chambord; and he was subsequently promoted to three different abbies, among which was that of La Trappe, and to other places of honour and trust in the church. He studied divinity at the Sorbonne, and in 1651, he was ordained priest; and in less than three years, the degree of doctor of divinity was conferred upon him by the faculty of the Sorbonne. Having thus completed his studies, he entered into the world, and, like one broken from his shackles, he devoted himself eagerly to its honours, pleasures, and gaieties. He soon became a favourite at court, and was appointed almoner to the duke of Orleans, and one of the deputies of the second order in the assembly of the clergy in 1655. On a sudden, and for a cause that never was well understood, he became disgusted with the world, and resolved to renounce for ever its pleasures, enjoyments, and vanities. No sooner had the abbé de Rance formed the resolution than he withdrew to his estate in the country, to deliberate concerning the mode of life which he should pursue. Having made up his mind to embrace the monastic life, he sold his estate, and bestowed the money which it produced on the Hôtel-de-Dieu at Paris. He also resigned all his benefices and dignities, excepting his priorship of Boulogne, and the abbey of La Trappe; the latter of which he retained by a special permission of the king, in order to introduce into it a reformation of the statutes and discipline. He took the habit, and made his profession in the year 1664, and left about establishing the gloomy and austerer discipline of monkery in its full perfection. The part it seems peculiarly suited to the corruptions to which he belonged, being the most gloomy, harren, and desolate spot in the whole kingdom of France. Here the days of the monks were constantly spent in prayers, tears, contemplation, silence, the perusal of holy books, the hardships of bodily labour, and the practice of the most rigid austerities. All other designs and occupations, however laudable and excellent in themselves, they were to regard as vain and useless to persons of their order. The least relaxation, or amusement of the most innocent nature, they were not allowed; and they were prohibited from engaging at all in literary studies. Strange! that a mind flored with liberal knowledge, and distinguished by good taste, should have been so far perverted by superstitious and fanaticism, as to devise or sanction such regulations.

That the world might be acquainted with the discipline of his community, he published "A Treatise on the Sanctity and Duties of the Monastic State." As de Rance advanced in years, the severe discipline to which he strictly conformed, rendered him so infirm, that, finding himself unequal to the duties of his post, he resigned it into the king's hands, but was permitted to appoint his successor. At length, worn out with infirmities and mortifications, and lying on a bed of ashes and straw, he died in 1700, in the 74th year of his age. He was author of a great number of theological and other pieces, among which may be mentioned "Moral Reflections on the Four Evangelists," "The Constitution and Rules of the Abbey of La Trappe," in 2 vols.; and "A Discourse on Purity of Intention." Moreri.

RANCE, in Geography, a river of France, which runs into the sea near St. Malo.

RANCHANO, a small island near the coast of Darien, in the Pacific ocean.

RANCHERIA, a town of South America, in the province of San Cristobal, and province of St. Martha; 20 miles N.E. of Hacha. N. lat. 14°. W. long. 72° 36'.—Alfo, a small island in the Pacific ocean, near the coast of Veragua. N. lat. 7° 5°. W. long. 82° 16'.

RANCHERIAS, a name given, in the province of Panama, to assemblages of Indian huts under the jurisdiction of a village. These rancherías are situated to the southward, in the small chasms or breaches of the mountains.

RANCID, in Rural Economy, from the Latin rancidus, of rancio, to be rank, a term applied to substances, which have contracted a strong offensive smell and taste by keeping, as bacon, butter, and all fat substances are apt to do. It would be a very useful discovery, to find out any easy simple method of preventing this effect from taking place.

RANÇON, in Geography, a river of France, in the department of the Lower Seine, which runs into the Seine, at Caudebec.—Alfo, a town of France, in the department of the Upper Vienne; 8 miles E. of Bellac.

RANCONET, ARMAND DE, in Biography, a learned and worthy magistrate, who flourished in the 16th century, was born at Bordeaux, in which city his father was an advocate of parliament. Having received the advantages of a good education, he became deeply skilled in the Roman law, to the study of which he joined that of philosophy, mathematics, and antiquities. Having been some time a counsellor in the parliament of Bourdeaux, he was raised to the post of president of the fourth chamber of inquests in that of Paris. The religious contents of the time were fatal to him. When the cardinal of Louvain assembled the parliament of Paris, to procure its opinion concerning the punishment of heretics, Rancet brought the works of Sulpicius Severus, and read aloud the passage in which that writer condemns the execution of Priscillian; upon this the prelate caused him to be imprisoned in the Bafhele, where he died of grief in 1559, at the age of 60. His latter days had been singularly unfortunate. He was reduced by want to be a corrector of the press to the Stephens. He saw his daughter die on a dunghill, and his son executed, and his wife was killed by lightning. This learned man published fearlessly any thing in his own name, but contributed much to the labours of others. He is said to have had the chief part in the valuable treatise, "De Verborum Significatione," and in the "Formula" of Briffon; and Pithou affirms,
affairs, that he compiled the Dictionary that bears the name of Charles Stephens. He wrote "Le Trefor de la Langue Françoise, taut ancienne que moderne," Moreri.

RANCONNIERES, in Geography, a town of France, in the department of the Upper Marne; 9 miles W. of Bourronne.

RANDEL, Dr. John, in Biography, organist, doctor in music, and music professor in the university of Cambridge. He was brought up in the king's chapel, was one of the children of that choir who first performed in Handel's oratorio of Esther, at the house of Bernard Gates, master of the boys in James-Ireet, Westminster, on Wednesday, February 23, 1731, when it was performed in action, previous to its having been heard in public, or any where but at Cannons, the magnificent seat of the duke of Chandos, for whose chapel it was composed in 1720.

Raland was not rated very high in his profession: he was regarded as a flight organ-player, and had never distinguished himself as a composer. He obtained his degree at the installation of the duke of Grafton in the university of Cambridge, for which he composed the ode written by Mr. Gray, to the establishment of all the musical profession, by undertaking to have it performed by the musicians resident in the university, without putting his grace to the expense of additional hands and voices from London, as Drs. Greens and Boyce had thought necessary on former occasions at Cambridge, and Dr. William Hayes at Oxford.

As Dr. Randal's professional life was unmarked by talents, his death, which happened in 1799, was hardly noticed, except by the candidates for the professorship, and his organist's places.

RANALSTOWN, in Geography, a post-town of Ireland, in the county of Antrim, in the neighbourhood of which is Shanes castle, the seat of lord O'Neill. It is situated on the river Maine, to the northward of lough Neagh. Randalstown is 4 miles N.W. from Antrim, and 88 N. by W. from Dublin. Before the union, it was represented in parliament. Carlile, &c.

RANDANS, a town of France, in the department of the Puy-de-Dôme, and chief place of a canton, in the district of Riom; 12 miles N.E. of Riom. The place contains 10447, and the canton 7996 inhabitants, on a territory of 130 kilometers, in 11 communes.

RANDASALMI, a town of Sweden, in the government of Kuopio; 52 miles S. of Kuopio.

RANDAZZO, a town of Sicily, in the valley of Demona; 25 miles W. of Taormina. N. lat. 37° 57'. E. long. 15° 4'.

RANDER, a town of Hindoostan, in Guzerat, on the Taptee, opposite to Surat.

RANDEG, a town of Austria; 8 miles N.E. of Bavarian Weidhoven.

RANDERADT, a town of France, in the department of the Roer; 10 miles N.W. of Juliers. N. lat. 50° 59'. E. long. 6° 8'.

RANDERS, a town of Denmark, in North Jutland, on the Gulden. This town is reduced, and has now only one parish church, a grammar-school, an hospital, and a chapel near the town. The chief articles of trade consist of leather gloves, salmon, earthen-ware, and strong beer. It was formerly well fortified; 20 miles E. of Viborg. N. lat. 56° 28'. E. long. 10° 3'.

RANDESSACKER, a town of the duchy of Wurzburg, on the Main; 2 miles S. of Wurzburg.

RANDIA, in Botany, is so named by Houttoun and Linnaeus, in honour of Mr. Isaac Rand, F.R.S., an apothecary in London, who filled the place of lecturer and de-

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monstrator of botany in the Chelsea garden, from the year 1722 to 1730. He published in 1750 an octavo index of the official plants of that collection, 518 in number, specifying the part of each used in physic. He also printed, in 1739, a general catalogue of the Garden. His name often occurs among the botanists of that period. The Randia, however, of which two supposed species are defined in Linn. Sp. Pl. 213, 214, by the names of militiae and aculeatae, both West Indian shrubs, is now sunk in Gardenia; see that article, where we have suggested a doubt, possibly not well founded, of the propriety of this measure. Both species of Randia are united by Willdenow, Sp. Pl. v. 1. 1230, on the authority of Swartz, as well as in Ait. Hort. Kew. v. 1. 370, under the name of Gardenia Randia. This plant, sent by Houttoun to Miller, before the year 1735, does not appear to exist in our floses at present. Its form may be seen in Browne's Jamaica, 143, t. s. i. 1. That author says the pulp of the berries flains paper or linen of a fine permanent blue, which refills the action of soap and of acids. The shrub is frequent in the low lands of Jamaica, on the most barren clay soil.

RANDBITZ, in Geography, a town of Bohemia, in the circle of Schlau; 12 miles N.N.E. of Schlau. N. lat. 50° 35'. E. long. 14° 24'.

RANDELPH, Thomas, in Biography, an English poet of great celebrity, was born at Newnham, in Northamptonshire, in 1605. He was educated at Westminster school, and having completed his course, he was elected to Trinity college, Cambridge. He shewed an early turn for poetry, and at ten years old wrote "The History of the Incarnation of our Saviour," in verse. He acquired an unfortunate, and, to him, a fatal habit of conviviality, which diverted him from the pursuit of any profession, and which led him to waste his scanty patrimony, and his health, in the company of wits and men of pleasure in the metropolis.

He died in his 35th year, to the great regret of those who admired his poetry and loved his company. He possessed an excellent genius, and had his life been extended, it has been thought he might have attained to a very high rank among the poets of his age. His miscellaneous poems were collected after his death by his brother, who published them at Oxford, in 1640. They have been, but not of late years, several times reprinted. He likewise composed fix dramatic pieces of the comic class, one of which, "Hey for Honely, down with Knavery," was taken from the Plutus of Aristophanes. His pieces are said to be some of the best in the manner then prevalent, which consisted in playing with words and thoughts, and connecting remote ideas by fanciful refinements. His expressions are often elegant, and his verses harmonious. His friend, Sir Christopher Hatton, cured, at his own expense, a monument of white marble to be erected over his grave, the inscription on which, in Latin and English verse, was made by Peter Haul'd. Biog. Brit.

RANDELPH, John, a learned prelate of the church of England, defenced from a respectable family in Kent, was born July 6th, 1749. He was the younger son of Dr. Randolph, formerly president of Corpus Christi college, Oxford, who died in March 1783, after having presided over the college for the long space of 35 years. The president's father was recorder of Canterbury, and had several sons, among whom was Dr. Francis Randolph, principal of Alban Hall, Oxford. The whole family have been remarkable for their orthodoxy zeal and attachment to the established religion of the country. The subject of this article became a student of Corpus Christi college, Oxford, where he took his several degrees, that of D.D. he had by diploma in 1783. Previously
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viously to this he had been appointed preceptor of poetry, proctor, and in 1782 Regius professor of Greek. In this same year he was made prebendary of Salisbury, canon of Christ-church, and Regius professor of divinity; and in 1783 rector of Ewelme. In 1799 he was elevated to the bishopric of Oxford, from which he was translated to that of Bangor in 1807, and then to the metropolitan see of London in the year 1809. Notwithstanding these high preferment he puffed a great part of his life in the university of Oxford, and it was generally believed that when he was elevated to the see of Oxford, the university was complimented with the nomination by the crown. His lordship was author of many fanglo sermons, and charges delivered on different occasions; also of "De Graeco Linguæ Studio Praebentio habita in Schola Linguorum," 1783, and "Concio ad Clerum in Steando Provincialis Cantuariensis Provinciae ad D. Pauli," 1790. His lordship was a zealous promoter of the National schools in opposition to those founded by Lancaster, and he was understood to be a violent opponent to the bible society, and to the spread of what has been termed sectarism. One of his last works was a Report of the Progres made by the National Society, to which the general committee referred in terms of gratitude, at their first meeting after his lordship's decease, in the following terms: "Whose latest employment had been to flate, for the information of the public, the progress of a work to which he had contributed his time, his labour, and his counsels, the committee could not fail to entertain a common sentiment of profound regret for the loss which they have sustained, and to cherish in their minds the liveliest recollection of the service which has so successfully fulfilled by him in this second report. They wish, therefore, to add to this document, designed for general circulation, their sense of what is due from the public, and themselves, to the memory of one who was a constant and affilidous promoter of this salutary institution, from its first establishment to the last hour of his life. The committee trust, that this testimony, though limited to a single object in the large field of pastoral duty in which he was incessantly engaged, may serve to denote the benefits which have resulted from his prompt, unwearying, and effectual exertions."
The following is the character drawn of him by Mr. archdeacon Jefferyson, and which alludes to his zeal for the church of which he was an active member. "Fearless now of being cenured for mercenary adulation, or reproved by unconfident merit, a just tribute may be paid to the character of that departed and exalted prelate, who is, and will be, most lamented where he was born and most entirely known. This opportunity, therefore, is willingly embraced of offering a heart-felt condolence to the ministry of the diocese on the affecting and important loss, which, in these perilous times of contending sects and unsettled opinion, has arisen to them, and to the church:—To them, in the premature privation of a dioecesan, firm in his support of ecclesiastical authority, but considerate in its application; eminently verded in the letter of ecclesiastical law, but liberal in its practical construction, reluctant in interference, but determined in duty, flow in the profussion of service, but prompt in its execution; disinterested in patronage, unwavering in measures, correct in judgment, attentive in counsel, and kind and compassionate to diftrees:—To the church, in the premature privation of a father, diligent in her rites and services, but unobtensive in piety and devotion; found and unrelaxing in her doctrines and faith, but discreet in zeal, and comprehensive in charity; ever vigilant in defending her interests, ever forward in asserting her privileges, and ever able in the assertion and the defence." The bishop died suddenly on the 28th of July 1813. He was one of the governors of the Charter-house; trustee of the British Museum; dean of the Chapel royal; visitor of Sion college; and provincial dean of Canterbury. Gent. Mag.

RANOLD, in Geography, a post-town of America, in Massachusetts, formed of the S. precinct of Brantree, in Norfolk county, in the year 1783: 15 miles S.E. of Bolton. The inhabitants are mostly farmers, but manufacture large quantities of shoes for market.

RANOLD, a county of Hillborough district, in North Carolina, bounded N.E. by Orange, and N.W. by Guildford. The number of inhabitants is 10,112, and they are mostly Quakers; the other denominations are Presbyterians, Baptists, Methodists, and Universalists. Their good land produces 40 or 50 bushels of Indian corn, or 20 of wheat, per acre. The chief town is Ashborough.

RANOLD, a county of Virginia, bounded N. by Monongalia, and S. by Pendleton. The number of inhabitants is 2854.

RANOLD, a post-town in Orange county, Vermont, being the 4th town W. of Thetford, on Connecticut river. The number of inhabitants is 2555. White river, by its two branches, waters the E. and W. side of the town. It has a large bed of iron ore, two forges, and a flitting mill. The congregational meeting-house has a steeple, and is large; 47 miles from Rutland.

RANOLD, a county of the Indiana territory.

RANOLD, a town of Morris county, in New Jersey, containing 1271 inhabitants.

RANDOM, a township of Sussex county, in Vermont, W. of Brunsviow.

RANDOM, a small island in Trinity bay, near the N. east of Newfoundland. N. lat. 48° 15'. W. long. 53° 45'.

RANDOM, Shetland island, a flat made when the muzzle of a gun is raised above the horizontal line, and is not designed to shoot directly, or point-blank.

The utmost random of any piece is about ten times as far as the bullet will go point-blank; and the bullet will go farthest when the piece is mounted about forty-five degrees above the level range.

The space or distance of the random is reckoned from the platform to the place where the ball first grazes.

RANDOM, in Geography, a river of Brandenburg, which runs into the Ucker; three miles S. of Uckermunde.

RAND, a lake of Norway, in the province of Aggerhus, 35 miles long, and two broad; 20 miles N. of Christiannia.

RANDSBERG, a town of Sweden, in Winf Gothland; 76 miles E. of Uddevalla.

RANDYCHOAR, a town of Bootan; 18 miles N. of Beyhar.

RANA, a town of Welf Bothnia; 60 miles W. of Torseca.

RANELACH, Rutland and Gardens, built and opened for musical performances and public amusements in 1742. The building was erected in the Ipacious garden belonging to the residence, at Chelsea, of Lord Ranelagh, one of the ministers of Charles II., when paymaster of the army. It was planned by the late Mr. Lacey, afterwards joint-patentee of Drury-lane theatre with the great actor Garrick.

At the first opening of this stupendous building, several experiments were made in placing the orchestra, in filling it, and in the time of performance, before it was settled as an evening promenade. The orchestra was at first placed in the middle of the rotunda. The performance was in a morning; and oratorio choruses chiefly furnished the bill of fare. Sir John Barnard complaining to the magistrates, that
that the young merchants and city apprentices were frequently seduced from their counting-houses and shops by these morning amusements, they were prohibited, and the doors opened at fix o'clock in the evening. The performance, however, did not begin till eight o'clock, but was ended at ten.

It was intended to rival Vauxhall, and was little injured by bad weather; as the company, at such times, had a safe and pleafant retreat into the rotunda, and as few went thither but in carriages.

Its success as an evening's amufement remained undiminished more than forty years. It was ruined by the late hours to which it was gradually brought by fine folks, who, at length, never came thither till past ten o'clock, when the musical performances were over, and sober people used to return home before eleven o'clock to their flippers, which enabled them and their fellows to go to bed, and ride, at their accustomed time.

But, at length, perfons of rank and fashion made a de- bauch of this innocent amufeement, and went to it and departed from it as late as at a masquerade. This precluded all that had anything to do themselves, or any employment for their fellows in the morning, and so much refined the company, that at midnight there had been seldom sufficient money received at the entrance, to cover the expence of the lamps, the terms of admiflion being only 3s., for which, besides a good concert by the bell performers in London, the company was furnished with excellent rolls, butter, and tea. In the year 1803 it was shut up, and only used occasionally for a masquerade, a festival, or an exhibition of fire-works. But since the period just-mentioned, the building has been pulled down, and the materials sold piecemeal, as was the cafe at Cannons, the splendid mansion of the duke of Chandos, (or Palazzo, as it would have been called in Italy,) and the ground is now (1809) of no other utility than occasionally to drill and exercife the Chelsea volunteers.

RANES, in Geography, a town of France, in the department of the Orne; 10 miles S.W. of Argentan.

RANESTAD, a town of Sweden, in Angermanland; 50 miles N.N.E. of Hernfand.

RANFORCE RING. See Reinforced Ring.

RANG, in Geography, a town of Sweden, in the province of Skonen; 11 miles S.S.W. of Lund.

RANGA, in Hindoo Mythology, one of the many names of Siva, the perfonification, according to the Hindoo mythologists, of the deftructive or changing form of the deity. (See Siva.) The epithet Sri, meaning holy, or divine, or bleffed, prefixed, has given this name to the capital of My- nore; Sri Ranga-pattan being the city of the bleffed Ranga, altered by Europeans to Seringapatam. See Sri.

RANGALORE, in Geography, a town and fortresses of Hindooftan, in the circur of Cicaole; 38 miles W. of Cicaole.

RANGAMATTY, a circur of Bengal, bounded on the N. by Bootan and Affam, on the E. and S. by Affam, and on the W. by Baharpund, Bettebund, and Goollah; about 40 miles long, and from 10 to 40 broad. Rangamatty, the capital, is 128 miles N.N.E. of Moorehabad, and has a celebrated pagoda. Lat. 26° 8'. Long. 96° 6'.

RANGAÑJA, a town of Bengal; 15 miles N.E. of Chittigong.

RANGAPALEAM, a town of Hindooftan, in Coim- betore; eight miles N.N.E. of Daraporem.

RANGAPIILLA, a town of Hindooftan, in the Carnatic; six miles N.E. of Pondicherry.

RANGASUNDRAM, a town of Hindooftan; 15 miles W. of Tinveelly.

RANGE, in Gunnery, the path of the ball, or the line it describes from the mouth of the piece to the point where it lodges. The flight of a shot is diftinguifhed, by artillermen, into three different ranges, of which the firft is called the point-blank, the fcond the random-shot, and the third the ricochet, or rolling and bounding shot. The firft, or point-blank, is to fuppofe a piece ftruck upon a level plain, and laid level, then the distance between the piece and the point where the shot touches the ground firft, is called the point- blank range of that piece; but as the fame piece ranges more or les, according to a greater or les charge, the point-blank range is to be underftood to be that, when the piece is loaded with that charge which is commonly ufed in action. This range is much lefs than the greatest range, or ran- dom-shot; but the piece cannot be leveled, on, as it is generally expreffed, 'printed at an object intended to be batted, if that object is not within the distance of the pointblank range; for beyond that the fhot is very uncertain, therefore rarely ufed in the fervice, and on land only when the fhot cannot fail of doing great execution in the place on which it falls. In ricochet firing, the piece is only elevated from three to fix degrees, and loaded with a small charge, in order that the ball may be bounded, and roll along the infide of the para- rapet. The fhot, thus difcharged, goes rolling and bounding, killing and maiming, or detroying all it meets in its courfe, and creates much more disorder by going thus slowly, than if thrown from the piece with greater violence. See CANNON, GUN, and PROJECTILE.

Range of a Projectile, Amplitude of the. See Amplitude.

RANGE, Point-blank. See Point-blank.

RANGE, in a Ship, denotes a fufficient length of the cable, drawn up on the deck, before the anchor is cast loose from the bow, to let it limp to the bottom, without being interrupted, that the flukes may be forced the deeper into the ground, by the additional weight which the anchor acquires in finking. For this reafon, the range, which is drawn up out of the tire, ought to be equal in length to the depth of the water, where the ship anchors.

RANGER, a sworn officer of the forest, whose bufines is it to walk daily through his charge, to drive back the deer out of the purlieus or defarted places into the forest lands; and to prefent all trefpaffers done in his bailiwick at the next court held for the forest.

The ranger is made by the king's letters, and has a fee paid yearly out of the exchequer, and certain fee-deer. In the Charta de Forefta mention is made of twelve kinds of rangers. It is now principally a honorary and finceure employment; but the holders sometimes likewise receive pay.

RANGES, in Ship Building, horned pieces of oak, like belaying cleats, but much larger, bolted to the midle of a ship, in the wail, for belaying the tacks and feetes. Also those pieces of plank fixed between the ports, with femi-circular holes in them for keeping flint in.

RANGIFER, in Zoology, a variety of the Cervus Tar- randus; which fee.

RANGING, in War, the difpofing of troops in a condition proper for engagement, or for marching. In Building, the side of a work that runs straight, without breaking into angles, is faid to range, or run range.

RANGOON, in Architecture, a town of the 3rd P 2 Birm.
Birman empire, situated on a branch of the Irrawaddy, called the Rangoon river, which forms the only communication that the Pegue river has with the sea. The town, in its present state, has been extended by increasing trade and consequent population far beyond the limits which formerly comprehended Rangoon, as it was originally founded, in 1755, by Alompra, the sovereign of the Birmen empire, Rangoon, or DagOEung, which signifies victory achieved, was denominated Dagon, before Alompra took it, and laid the foundation of the present town. Here, flood, in former days, a large and populous city, called in the Pali, or sacred language, Singouterra; the site of which Alompra diligently explored, and raised on its ruins the present flourishing sea-port of the Pegue dominions. Dagon, often called Shoe-Dagon, or the golden Dagon, is a name peculiar to the temple; a noble edifice, three miles distant from the banks of the river. (See Dagine.) Rangoon stretches along the bank of the river about a mile, and is not more than a third of a mile in breadth. The city, or quay, (mious being a term applied either to a city or a district,) is a square surrounded by a high stockade, in the manner of the country, and on the N. side it is further strengthened by an indifferent fosse, across which a wooden bridge is thrown; in this face there are two gates, in each of the others only one. Wooden flages are erected in several places within the stockade, for musqueteers to stand upon in case of an attack. On the S. side, towards the river, which is about 20 or 30 yards from the palisade, there are battery huts, and three wharfs, with cranes for landing goods. A battery, of twelve cannon, six and nine-pounders, raised on the bank, commands the river; but the guns and carriages are in such a wretched condition, that they could do little execution. Close to the principal wharf are two commodious wooden houses, used by the merchants as an exchange, where they usually meet in the cool of the morning and evening, to converse, and transact business. The streets of the town are narrow, and much inferior to those of Pegue, but clean and well paved; there are numerous channels to carry off the rain, over which strong planks are laid, to prevent an interruption of intercourse. The improvement of the town has been very much owing to the activity of the descendant of a Portuguese family, named Jannee, of low origin, but advanced at length to the important office of Shawbunder, or intendant of the port, and receiver of the port-customs. Under his direction and influence, the streets were paved, several well built wooden bridges were constructed, and also a wharf, which, extending into the river, and raised on posts, enables the ships to deliver and receive cargoes without the assistance of rivercraft; under his direction also a spacious custom-house has been erected. This is the only lay building in Rangoon that is not constructed of wood, it is composed of brick and mortar, and the roof covered with tiles; within, there is a number of wooden flages for the reception of bale goods. The houses, in general, are raised on posts from the ground; the smaller supported by bamboos, the larger by strong timbers. All the officers of government, the most opulent merchants, and persons of consideration, live within the fort; shipwrights, and people of inferior rank, inhabit the suburbs; and one entire street, called Tackally, is exclusively assigned to common prostitutes, who are not permitted to dwell within the precincts of the fortification. Swine are suffered to roam about the town at large; they do not belong to any particular owners, but are regarded as servants of the public, or common scavengers; as they go under the houses and destroy the filth. The Birmans are also fond of dogs, numbers of which infest the streets; the breed is small, and very noisy. The borders of the terrace on which the temple of Dagoeung is raised, are planted with shady trees in regular rows; and from this eminence there is a beautiful and extensive prospect; the Pegue and Rangoon rivers are seen winding through a level woody country, and the temple of Syriam, little inferior to others at Pegue and Rangoon, stands near the junction of the Irrawaddy. The road leading from the city to the temple is formed with care, a wide causeway in the centre throwing off the rain to the sides; and numberless little spaces are ranged along the edge of the road, in which are niches to receive small images of their divinity Gaudma. Several kiosons or monasteries lie in this direction, generally removed at a short distance from the public way, under the shade of pipal or tamarind trees. The Birmans being, like other inhabitants of the east, fond of processions, scarcely a week passes in which there is not a religious display at Rangoon; either a funeral of fame person who leaves sufficient to defray the expense of a pompous public burning, or the ceremony of admitting youths into the convents of the Rahaans, on which occasion parents and friends spare no expense in entertainments and presents to the Rahaans. See Rahaans. The population of Rangoon is considerable; there are 5000 registered taxable houses in the city and suburbs; so that if each house be supposed to contain six people, the total will amount to 30,000. Having long been the asylum of insolvent debtors from the different settlements of India, it is crowded with foreigners of desperate fortunes, who find from the Birmans a friendly reception, and generally support themselves by carrying on a small trade. The exchange, if it may be so called, exhibits a motley assemblage of merchants, such as few towns of much greater magnitude can produce; Malabars, Mozguns, Perfians, Parnees, Armenians, Portugueze, French, and English. The members of this discordant multitude, engaged in various branches of commerce, are not only permitted to reside under the protection of government, but likewise enjoy the most liberal toleration in matters of religion. They celebrate their several rites and festivals, totally disregarded by the Birmans, who have no inclination to make proselytes. In the same street may be heard the solemn voice of the Muezin, calling pious futilities to early prayers, and the bell of the Portuguese chapel tinkling a fummons to Romish Christians. Processions meet and pass each other without giving or receiving cause of offence. The Birmans never trouble themselves about the religious opinions of any sect, nor disturb their ritual ceremonies, provided they do not break the peace, or meddle with their own divinity Gaudma; but if any person commit an outrage, which the Mussulmen, in their zeal for the true faith will sometimes do, the offender is sure to be put into the flocks; and if that does not calm his turbulent enthusiasm, he is banished to tranquillity. The Parnees, the Armenians, and a small proportion of Mussulmen, engrofs the largest share of the trade of Rangoon; and individuals from their number were frequently selected by government to occupy employments of trust, that related to trade and transactions with foreigners, the duties of which the Birmans conceive that such persons could perform better than themselves. These people, particularly the Armenians, naturally beheld with a jealous eye any ordinance of a commercial nature, that may tend to diminish their influence, and deprive them of that dictatorial power, which they assume and exercise over all merchants and mariners that resort to Rangoon; but of none are they so apprehensive as of the English: a connection with whom might teach the Birmans to transact foreign business without their assistance, and give them a more adequate lance of their own interest. The
The French have long maintained an agent at Rangoon, and are thoroughly acquainted with the advantages which the country of Pegue affords. The imports into Rangoon from the British settlements in the years 1794—5, amounted, according to Mr. Symes, to more than twelve lacks of rupees, about 135,000l sterling: these consisted chiefly of coarse piece goods, flaps, hardware, and broad cloth, the demand for the last article being considerable; and returns were almost wholly made in timber. Teak, the most durable wood that is known, and best adapted for the construction of ships, is produced in the Birman and Pegue empire inexhaustible abundance. The river of Rangoon is equally commodious for the construction of ships; the spring tides rise 20 feet in perpendicular height; the banks are soft, and so flat, that little labour is necessary for the formation of docks: vessels of any burden may be built. Nature, says Symes, has liberally done her part to render Rangoon the most flourishing sea-port of the eastern world. The entrance of the river, about twelve miles below Rangoon, and the banks on each side, bear a near resemblance to those of the Ganges; but the navigation is much more commodious. The channel is bold and deep, from six and a half to eight fathoms, uninterrupted by shoals or inequality of soundings. At this place the breadth of the river is estimated to be from three quarters to one mile. On the bank of the river, opposite to Rangoon, is a considerable town, called Maindu, the residence of the governor of the province of Dalla. This government is entirely distinct from Rangoon, on the cast side. The city of Dalla, from which the town takes its name, is said to be on the west side of the China Buckier river, and was formerly a place of considerable importance. The town of Maindu is composed of one long street; at the end of which is a creek, which goes all the way to Baffin, and has twelve feet depth of water, at high tide; on the west side is a smaller creek, on the bank of which stands a village called Mima-Shunra, or the village of profiteers, being wholly inhabited by women of that description. Rangoon lies in N. lat. 16° 47'. E. long. 96° 9'. Symes's Embly to Ava, in 3 vols. 2vo. See BIRMAN Empire.

RANGSIO, a town in Sweden, in Helsingland; 15 miles W.N.W. of Soderhamn.

RANGUANA, a small island in the bay of Honduras, near the coast of Mexico. N. lat. 16° 25'. W. long. 88° 52'.

RANHADOs, a town of Portugal, in the province of Beira; 18 miles N.W. of Castel Rodrigo.

RANINA, Arts et Veu, in Anatomy, the artery and vein situated on the inferior surface of the tongue. See ARTERY and VEIN.

RANINAL VESSELS, Bleeding from. See FRENUM LINGUE, Division of.

RANISH, in Geography, a small island near the W. coast of Scotland. N. lat. 57° 55'. W. long. 5° 5'.

RANK, a due order, or a place allotted a thing suitably to its nature, quality, or merit.

Kings are persons of the first rank on earth. In castles, procellions, &c. every person is to observe his rank.

RANK, in Military Discipline, denotes a series, or row of soldiers, placed side by side; a number of which ranks form the depth of the squadron or battalion, as a number of files does the width.

When infantry is drawn up three deep, the first rank is called the front rank; the second, the centre rank; and the third, the rear rank.

To close the ranks, is to bring the men nearer; to open it, is to set them farther apart. To double the ranks, is to throw two into the space of one, by which the files are thinned. See Doubling.

RANK, in the Army and Navy, is used for the order of precedence; which see.

In the army the officers in the life-guards are entitled to the rank of lieutenant-colonel, when they obtain or purchase a majority, provided they are of seven years standing. Their commissions in this case run major and lieutenant-colonel. But if an officer should not have completed either of those periods, he obtains the rank of major only until its completion. A lieutenant-colonel attains to the rank of full colonel if he has been seven years major, or twenty-one years in the British service. Cornets in the life-guards rank as sub-lieutenants in their own corps, and as first lieutenants in the army. The English fuzileers enjoy the same privilege. Sub-lieutenants in the Welsh fusileers, rank only as second lieutenants in the army. Marines do the fame.

Officers of the regular forces command the officers of equal degree belonging to the other services. Officers of the militia, fencibles, yeomanry cavalry, and volunteer corps, rank together, according to the dates of their respective commissions. These regulations are subject to some exceptions, specified in the articles of war. Officers of the militia rank generally with the regular forces as junior of their respective commissions. An enjoin in the guards ranks no higher than an enjoin in the regulars. The chief of the engineers ranks as colonel; director, as lieutenant-colonel; sub-director, as major; engineer in ordinary, as captain; engineer extraordinary, as captain-lieutenant; sub-engineer, as lieutenant; practitioner-engineer, as enjoin.

In the navy the admiral or commander-in-chief of his majesty's fleet has the rank of a field-marshial; admirals, with the flags on the top-mast-head, rank with generals of horse and foot; vice-admirals, with lieutenant-generals; rear-admirals, as major-generals; commodores with broad pendants, as brigadier-generals; captains of post-ships, after three years from the date of their first commission, as colonels; other captains, commanding post-ships, as lieutenant-colonels; captains, not taking post, as majors; and lieutenants, as captains.

Rank, Brevet, rank without pay, nominal distinction, which sometimes entitles the holder of it to command in mixed service. The brevet rank in the militia is confined to the colonels and adjutants of the several corps in that establishment. The former receive the brevet rank of colonels in the army whilst actually embodied for service, and command all lieutenant-colonels in the line when they do duty together. Adjutants in the militia may have the brevet rank of captain, provided they have served five years as lieutenants in the militia, or in other forces on the British establishment. In the line, an adjutant who has the rank of captain, may command as such when there is no superior officer on the parade, or for duty. This is not the case in the militia. No adjutant, let his brevet rank of captain be ever so ancient, can command the youngest captain of a company. The same difference prevails with respect to the captain-lieutenancy; which is literally brevet rank. In the regulars, a captain-lieutenant, the infant he is promoted to a company, takes rank according to the date of his first commission, and, as we have observed, may be major by brevet; but no captain-lieutenant can ever avail himself of that seniority to the prejudice of a captain of a company in the militia; nor can an officer in the latter establishment take advantage of his standing, when he quits one regiment to serve in another, even in time of war, although he may have the requisite qualifications in both counties.

Brigade majors rank with captains, provided they have
in the circar of Sanore; 20 miles W. of Bijnagar. N. lat. 15° 18'. E. long. 75° 37'.
RANNYDEE, a town of Bengal; 11 miles S. of Curruckdegh.
RANNYGONG, a town of Hindooftan, in Dowlatabad; 15 miles S.S.W. of Amedinagar.
RANNYGUNGE, a town of Bengal; 35 miles N. of Dinagepur.
RANNYPOOKRA, a town of Bengal; 30 miles W.N.W. of Rogonatpur.
RANO, a small island in the N. part of the gulf of Bothnia. N. lat. 65° 43'. E. long. 22° 52'.
RANRAN, a town of Cochinchina, and the capital of a province. N. lat. 12° 50'. E. long. 108° 56'.
RANSACKEN, a town of the duchy of Wurzburg; 3 miles S. of Wurzburg.
RANSOM, a sum of money paid for the redemption of a person out of slavery, or for the liberty of a prisoner of war.

With regard to prisoners of war, it is allowed that there is no obligation of releasing those who are detained as such, till after satisfaction has been obtained. Whoever makes a just war has a right, if he thinks proper, to detain his prisoners till the end of the war; and then, in releasing them, he may justly require a ransom, either as a compensation at a peace, or, if the war continue, for diminishing his enemy's prisoners, at the fame time that he strengthens him with the return of folder, Prisoners of war, among European nations, are exchanged or ransomed during the war; and this is generally stipulated in a previous cartel. If sovereignties at war have agreed on a cartel for the exchange or ransoming of prisoners, they are faithfully to observe it no less than every other convention; but if, as was formerly the general practice, the state leaves to every prisoner, at least during the war, the care of redeeming himself, such particular conventions offer many questions, of which some of the principal are the following. He who has acquired a lawful right of demanding a ransom from his prisoner, may transfer his right to a third person. This was practised in the last ages. But as the perdon taking a prisoner is obliged, for the sake of his reputation, to treat him with justice and humanity, he is not to transfer his right, in an unlimited manner, to one who might probably abuse it. When he has agreed with his prisoner, concerning the price of the ransom, he may transfer the right to whom he pleases. On the conclusion of an agreement made with a prisoner for the price of his ransom, it becomes a perfect contract, and cannot be rescinded from, under a pretence that the prisoner is discovered to be richer than was imagined; for there is no manner of necessity that he should be rated according to the wealth of a prisoner, because that is not the scale for measuring the right of detaining a prisoner of war. But it is natural to proportion the price of the ransom to the prisoner's rank and character; the liberty of an officer of distinction being of greater consequence than that of a private man, or inferior officer. If the prisoner has not only concealed, but disgraced his rank, it is a forbid fraud, and gives a right for annulling the agreement. If a prisoner, having agreed on the price of his ransom, dies before payment, it has been queried whether this price be due, and whether the heirs are obliged to discharge it? Unquestionably, says Vattel, they are obliged to it, if the prisoner died in the possession of his liberty; for, from the moment of his release, in consideration of which he had promised a sum, this sum becomes due, and does not at all belong to his heirs; but if he had not
not obtained his liberty at the time of his death, it can be no debt to him, or to his heirs, unless the agreement was otherwise; and he is not reputed to have received his liberty, till he is absolutely permitted to depart free; when neither the prisoner he was, nor the sovereign, opposed his release and departure. If indeed he has only been permitted to take a journey for applying to his friends, or his sovereign, in order to obtain the means of ransoming himself, and he dies before he is released of his full liberty, before his final discharge from his parole, nothing is due for his ransom. If, after agreeing on the price, he is detained in prison till the time of payment, and he dies before the debt is paid by his death, and does not affect his heirs; such an agreement on the part of him, who detains his prisoner, being no more than a promise of giving him his liberty for a certain sum paid down. A promise of buying and selling does not suppose the purchaser to pay the price of a thing, if it happen to perish before the bargain is concluded. But if the contract of sale be perfect, the purchaser shall pay the price of the thing sold, though it should happen to perish before the delivery of it, provided there was no fault or delay in the seller. For this reason, if the seller has absolutely concluded the agreement of the ransom, and from that time owns himself a debtor for the stipulated sum, remaining no longer as a prisoner, but for the security of the payment, his intervening death does not extinguish the debt: the ransom agreed on remains still due. If the agreement says, that the ransom shall be paid on a certain day, and the prisoner happens to die before that day, then the heirs are bound to discharge it; for the ransom was due, and the day was assigned, only, as the term for payment. Upon the same principles, strictly speaking, it follows, that a prisoner, releaved on condition of procuring the release or discharge of another, should return to prison, in case the latter happens to die before he could procure him his liberty. Such an unfortunate cafe, however, is entitled to regard, and equity seems to require that this prisoner should continue in the enjoyment of liberty, provided he pays a just equivalent; it being now out of his power to purchase it precisely at the price agreed on. If a prisoner fully set at liberty, after having promised, but not paid, his ransom, happen to be taken a second time, it is evident that, without being excused from paying his first ransom, if he is willing to be set at liberty, he must pay a second ransom. On the contrary, though the prisoner has agreed for the price of his ransom, if before the execution of the compact, before he is set at liberty in virtue of it, he be detained by his party, he owes nothing. It is here evidently suppos'd, that the finishing hand was not put to the compact, and that the prisoner had not acknowledged himself debtor for the rate of his ransom. He whose prisoner he was, had, as it were, only made him a promise of selling, and he had promised to purchase, but the purchase and sale had not actually passed into effect; the property was not actually transferred. The property belonging to a person does not pass to him who takes him prisoner, unless at the same time he seizes on such things. Of this there is no doubt, especially in our times of moderation, when prisoners of war do not fall into slavery. And even by the law of nature, the property of a slave's goods does not, without some other reason, pass to the master of a slave. There is nothing in slavery of which this can itself be the natural effect. If a man obtain a power over the liberty of another, does it follow that he has likewise a right over his property? Therefore, if a shipowner, or a master of a ship, has not ransomed his prisoner, or the latter has found means to conceal something from his search, what he has preferred should belong to him, or he may employ it towards the payment of his ransom. At present even prisoners are not always stripped. The death of a prisoner puts a period to the right of him who had taken him; therefore a hostage, given for the procuring of a person's liberty, is to be released the moment the prisoner expires; and if the hostage dies, the prisoner is not released by such death. The reverse of this is true, if one, instead of being a hostage for the other, had been subsumed in his stead. Vattel's Law of Nations, b. iii. ch. 17.

Formerly it was a common practice to ransom British ships, when captured by an enemy, by delivering to the enemy what was called a ransom-bill, which secured to the captor the price agreed upon, and operated as a bill of sale of the ship and cargo to the original owners, and as a protection to the ship against other cruisers of the enemy during the remainder of the voyage. A hostage was delivered to the captor, for securing to him the punctual payment of the stipulated sum. This ransom-bill, independent of the hostage, was considered as a contract of the law of nations, and obligatory upon the owners, as well as upon the captain and hostage who signed it; and actions have been often brought upon them in our courts of common law. And where the ship, or goods were injured, the amount of the ransom was usually taken to be the measure of the demand of the injured upon the underwriters, in respect of the capture. But this practice of ransoming ships captured by the enemy being found to operate more to the disadvantage than for the benefit of this country, it was thought proper at length to prohibit it altogether. And therefore by Stat. 22 Geo. III. c. 25. § 1. it is enacted, that it shall not be lawful for any of his majesty's subjects to ransom, or to enter into any contract or agreement for ransoming, any ship or vessel belonging to any of his majesty's subjects, or any merchandizes or goods on board the same, which shall be captured by the subjects of any state at war with his majesty, or by any person committing hostilities against his majesty's subjects. By § 2. all contracts and agreements which shall be entered into, and all bills, notes, and other securities, which shall be given by any person or perfons for ransom of any such ship or vessel, or of any merchandizes or goods on board the same, shall be absolutely void in law, and of no effect whatever. And by § 3. a penalty of $500. is given to the informer, for every offence against the act. This statute has put an end to all questions on the law of ransoms. Marshall's Treatise on the Law of Insurances, vol. ii.

In our Law Books, ransom is also used for a sum paid for the pardoning of some notorious crime. Horn makes this difference between ransom and amercia-ment, that ransom is the redemption of a corporeal punishment due to any crime. It is never usual to affix a larger fine than a man is able to pay, without touching the implements of his livelihood, but to inflict corporal punishment, or a limited imprisonment, instead of such fine as might amount to imprisonment for life. And this is the reason why fines in the king's court are frequently denominated ransoms, because the penalty must otherwise fall upon a man's person, unless it be redeemed or ransomed by a pecuniary fine (Murr. c. 5. § 3. Lamb. Edinlurch. 57.) according to an ancient maxim, "non habet in crimina baud in corpore." Yet, when an act statute speaks both of fine and ransom, it is held, that the ransom shall be treble to the fine at least. Dyer. 232. RANSTADT, in Geography, a town of Germany, in the principality of Stolberg; 17 miles N.E. of Frankfort on the Main. RANSTADT, or Mark Ranstadi, a town of Saxony, in the
the territory of Merseburg; 10 miles S.S.E. of Merseburg. N. lat. 51° 18'. E. long. 12° 14'.

RANT, in the Drama, an extravagant flight of passion, overhooting nature and probability.

Lee's tragedies abound with rants; yet the wildest of them, it is observed, have frequently met with applause on the stage.

We find instances of rants, even in our severest poets. Such, e. gr. is that in the beginning of Ben Johnstone's Cato, where the patriote, in speaking to Rome, says, "I'd plow up rocks, steep as the Alps in dust; and have the Tyrrhenian waters into clouds, but I would reach thy head!"

RANTAMPUR, in Geography, a circar of Hindoostan, in the country of Agimere, bounded on the N. by Jenagur, on the E. by Agra, on the S. by Kottah, and on the W. by Oudipour and Siroyo. — Alto, a town and forteres, being the capital of the above named circar; 86 miles E. of Agimere. N. lat. 28° 35'. E. long. 76° 58'.

RANTZAU, John, in Biography, a general in the Danish service, was born in 1492, and at the age of 13 he entered into the army. In 1515 he began to travel into foreign countries, visiting in succession England, Spain, Germany, Italy, Greece, Syria, Palestine, and other parts of the East. In 1517 he was knighted at Jerusalem; and upon his return to Denmark, was appointed to accompany duke Christian, afterwards Christian III., on his tour to Brandenburg, and other towns of Germany. When Frederic I. accepted the crown of Denmark, he was promoted to be a general in 1533, and entruted with the command of the troops in Holstein. He became greatly distinguished in his military character, and on various diplomatic contests, and died in 1569. As an author he is known by the following works: "A true and brief Account of the Wars carried on in 1559, by Frederic king of Denmark, and Adolphus duke of Holstein," &c.; "A Description of Cimbriz," printed in Welphalen's Monumenta inedita, tomi. i. Gen. Biog.

RANTZEN, a town of the duchy of Stiria; 6 miles N.W. of Muckran.

RANTZENBACH, a town of Austria; 6 miles S.S.W. of St. Polten.

RANVILLE, a town of France, in the department of the Calvados; 5 miles N.E. of Caen.

RANULA, dim. of rana, a frog. This term is, in Surgery, applied to a swelling of the salivary ducts under the tongue. Whether the tumour is so named from a whimsical fussipation that it bears a resemblance to a frog, or from its being fancied to oblige the patient to make a croaking noise, in attempting to articulate, is a point which surgical writers leave undetermined. The swelling is round, of a greyish colour like a hydatid, soft, compressible, indolent, and, in the early stage, almost transparent. At first, it is of about the same fize as a nut, or cherry; but, by degrees, its volume becomes much more considerable. It is very frequently met with in young children: its occurrence in adults is more uncommon. It consists of a subacute dilatation of the excretory tube of the submaxillary, or else of the sublingual gland, the orifice of which duct is by some cause or another flopped up, or obliterated; so that the confined salivary accumulates, becomes liquid and collects to flow in the usual manner. In proportion as the ranula increases, the incipient fize of it having been neglected, its enlarged fize raises up the tongue, and forces it backward; the consequence of which is, that mastication, deglutition, and respiration, are obstructed. The voice becomes indistinct, and hoarse; the motion of the tongue is restrained: this organ cannot be put out of the mouth. By degrees, the incisor and canine teeth of the lower jaw are loosened; the layer of mucusses, composing the lower parietes of the mouth, is depreffed; and the swelling, having attained a considerable fize, makes a very manifest prominence beneath the chin. In this advanced stage, that is to say, when the ranula has existed ten or twelve years, as practioners occasionally fee instances of, the appearance of the swelling is quite altered from what it originally was. The tumour is now hard, elaflic, painful, ulcerated, and, as it were, farcomatos: it is as large as a turkey's egg, and not situated at the side of the frcum, but anteriorly under the tongue, to which it is closely adherent. The mouth emits a very fetid smell; and the breathing is so-much obstructed, that the patient, through fear of suffocating, is obliged to lie with his mouth wide open, when he goes to sleep.

While a ranula is recent, the fluid which it contains is a vifcid saliva, resembling the white of egg, and sometimes of rather a yellow colour. In time it is gradually changed, becoming turbid and puriform; and, in certain instances, soft, friable, greyish concretions, from the fize of a pea to that of an almond, commonly called salivary calculi, are found in the kind of cyst, which is produced by the dilatation of the salivary duct. These calculi effentially conflict of a large proportion of the phophate of lime, united with a mucilaginous substance; and concrections of the fame kind frequently occur in the tonsils, and in the salivary glands themselves, as well as their excretory ducts. Forefetus, l. xiv. obf. 26. p. 112. Blegney, Nouvelles Découvertes, &c. tom. i. ann. 1679, p. 230. Mém. de l'Acad. chirurgic. tom. v. p. 464. Petit, Œuvres Polhibes, &c. tom. i. p. 188. Blissius, Òbl. 14. p. 81.

A ranula, whether recent or inveterate, cannot be cured except by a surgical operation. The curative indication, in the first of these fates, is to make an outlet for the fluid accumulated in the tumour, and to make an opening sufficiently capacious to let the saliva readily pass into the mouth. Merely making an incision into the swelling, or opening it with a trocar, or a fetic drawn through it, are flated to be ineffectual methods. The tumour does indeed subside as soon as the aperture is made; but the edges of the wound grow together again, and the disease recurs. There is an absolute necessity for first making an incision the whole length of the swelling, and then removing, with the aid of fitters and a pair of dilating forceps, a portion of the edges of the recent wound. This flight lots of subflance prevents the return of the complaint, and always infures a free paffage for the saliva; an advantage of which there is no certainty in any other mode of proceeding. By this flight operation, ranula in children may be cured in the course of a few days, without the least occasion for the application of any dressings whatsoever. It has been proposed to dilate the constricted orifice of the salivary duct with a probe. (Mém. de l'Acad. de chirurgie, tom. iii. p. 460.) But this orifice is difficult of detection, and the swelling cannot be in this manner eflily emptied. M. Laflis seems to entertain doubts whether Warton's canal can ever be made to resume its original fize, after once being clofed. Patho logic Chimurg. tom. i. p. 405.

When a ranula has existed a long while, is attended with considerable hardships, and is of large fize, it is a tumour which requires to be completely extirpated. A transverse incision, parallel to the opening of the mouth, is to be made in it through its whole extent. The surgeon is then to cut out...
out the upper portion of the swelling, situated in front of the frænum of the tongue, to which it is also adherent, and next the inferior portion, which sometimes extends into the interstice between the genio-hyoidei and genio-glosso muscles, with which it becomes confounded. A pair of forceps, a hook, scissors, and a straight bistoury, are the instruments necessary for this operation. A degree of hemorrhage always ensues. The use of a detergent gargle, made of barley-water and honey of roses, will serve to finish the curse in a very moderate space of time.

In confirmation of the latter observation, Laffius addsuces the following case: A young man, aged 22, had a ranula, which had continued ever since he was born, and was equal in size to a turkey’s egg. The incisor teeth of the lower jaw were loosened, and forced forward by the succive increase of the swelling. A fenton had been palps quite through it, without any useful effect. The breath of the patient and his saliva were intolerably fetid. The tumour was closely adherent to the lower and anterior part of the tongue; and extending laterally, confounded itself with this organ, of which it impeded the motion. A straight, narrow bistoury was introduced into one of the openings at the side of the tumour, and carried completely across to the opposite aperture. Thus a transverse incision was made into the cavity of the diseased. By means of the same instrument and a hook, the lateral portions of the swelling were removed. A profuse hemorrhage ensued, caused by the total division of the frænum, the palatine veins, and one of the palatine arteries. It was flopped by putting under the tongue a large quantity of dry lint, and by compressing the dorium of the tongue several hours with the fingers, while the thumb was employed in compressing the parts behind the chin from below upwards. This double fort of preflure answered the purpose. No caution was found necessary, and, by the use of deterrent gargles, the patient was cured in about a fortnight.

When a ranula of long duration, situated at the side of the tongue, and of considerable size, forms a tumour, that makes its appearance outwardly towards the base of the jaw, Laffius seems to disapprove of making a free incision through the skin, for the purpose of extirpating that part of the swelling which cannot be removed through the mouth; a plan which, in one instance, practised by Marchetti. Obf. Med. Chirurg. obf. 31. p. 48. See Laffius’ Pathologie Chirurgicale, tom. i. chap. 61.

RANULARES, in Anatomy. See RANINA. RANUNCULACEE, in Botany, the 6th natural order in Juflieu’s system, or the first of his 13th clas, for whose character see GERANIA. The Ranunculaceae are defined as follows. Calyx of many leaves, sometimes wanting. Petals definite, mostly five. Stamens indefinite, except in Myosurus; their anthers incorporated with the filaments. Germens few, indefinite, or definite, rarely solitary, placed on a common receptacle; each of them furnished with a style, which is rarely wanting, and a simple stigma. Capsule, or rarely berries, as many as the germens; in some infestures fingle-seeded, and not bursting; in others many-seeded, splitting half way down, at their inner margin, into two valves, bearing the seeds at the edges. Corolla minute, lodged in a cavity at the upper part of the large horny alurnum. Stem generally herbaceous. Leaves alternate; rarely (in Clematis and Atro-ene) opposite; some of them half flowering the stem; some compound, pinnate or fringed; some, as is more frequently the case, simple, and these are mostly palmate or lobed, their flowers often pale at the base. See RANUNCULUS. Vol. XXIX.

Juflieu divides the order in question into four sections.

Scéti. 1. Capsules single-seeded, not bursting; berries in Hydrargit.

This section consists of Clematis, Atroge, Thalidrum, Hydrargit, Anemon, Hamondys, Commeron, Adonis, Ranunculus, Ficaria, and Myosurus.

Scéti. 2. Capsules many-seeded, splitting at the inner edge. Petals irregular.

The calyx in this section is often coloured, being what Linnaeus terms corolla; that author considering the petals of Juflieu as nectaries. The genera are Trollius, Helleborus, Styporum, Nigella, Gareillida, Aquilegia, Delphinium, and Acanth. Some species of Delphinium have but a single capsule.

Scéti. 3. Capsules many-seeded, splitting at the inner edge. Petals regular.

Caltha, Persicaria, Zanthorrhiza, Cimicifuga.

Scéti. 4. Germens solitary. Berry of one cell, with many seeds, affixed to a single lateral receptacle.

The only genera are Atene and Podophyllum, and these we feel disposed to remove to Juflieu’s next order, Papaveraceae. See that article.

We cannot but remark that the petals, as Juflieu terms them, in Trollius and Helleborus are by no means definite, and that they greatly exceed the number five. Neither are they irregular in Trollius. As to the other genera of his 2d section, the parts in question are such obvious nectaries, that they can have no other function to perform, except possibly in Aquilegia, where their limb partsakes of the nature of petals.

RANUNCULOIDES, a genus of Vaillant’s, founded on the Ranunculus bedendorae and aquatilis of Linnaeus, and named from its resemblance or affinity to RANUNCULUS; see that article. No one has followed Vaillant in this influence, nor is there any real mark of distinction for his supposed genus. Ranunculoides is, besides, the specific name of a rare British Anemone, but ranunculina would have been better Latin; as in Helleborus ranunculina, Sm. Pl. Ir. f. t. 37. Willd. Sp. Pl. v. 2. 1336. See Helleborus.

RANUNCULUS, an ancient name, whose origin is as obvious as its fene is obscure. The word is, no doubt, derived from rana, and means a little frog. The Greeks call the same plant Νεανος, which is nearly synonymous. Most etymologists suppose this name to allude to the native flation of the plant, in bogs and watery places, such as frogs frequent. But the original Νεανος of Dioscorides is the beautiful Ranunculus aquatilis of Linnaeus, or Garden Ranunculus, which inhabits corn-fields, and does not grow in wet places; though indeed the other three species, described by that ancient writer, do; these are our lanuginosa, muricatus, and aquatilis. It seems possible that the divisions of the leaves in all these plants may have suggested the idea of a frog’s foot, which supposition is confirmed by the English name, Crowfoot. Ambroinus hints at a resemblance between the root and the foot of a frog, which is not, to us, by any means apparent.—Linn. Gen. 281. Schreb. 377. Willd. Sp. Pl. v. 2. 1527. Mart. Mill. Dict. v. 4. Sm. Fl. Brit. 587. Prodr. Fl. Græc. Sibth. v. 1. 380. Ait. Hort. Kew. v. 3. 351. Pursh v. 2. 391. Julf. 233. Poirer in Lamarck Dict. v. 6. 97. Lamarck Illführ. t. 498. Gapan. t. 74. (Ficaria; Dill. Gen. 108. t. 5. Huds. Angl. 244. Julf. 233. Ranunculodea; Vaill. Mem. de l’Acad. des Sciences for 1719, German edition, 321.)—Clas and order, Polyandria Polygynia. Nat. Ord. Multifilis, Linn. Ranunculea, Julf.

Gen. Ch. Cal. Perianth of five ovate, concave, fome-

G
what coloured, deciduous leaves. Cor. Petals five, obtuse, polished; with small claws. Nectary a cavity in each petal, just above the claw. Stam. Filaments very numerous, half the length of the corolla; anthers firmly united therewith, erect, oblong, obtuse, of two separate lobes. Pj. Germanos numerous, collected into a head; styles none; stigmas reflexed, very small. Peric. none. Receptacle beft with extremely minute falkes, to which the seeds are attached. Seeds numerous, naked, irregular, uncertain in figure, with a reflexed point.

Obf. The elliptical mark of this genus conflits, as Lin-~
neus remarks, in the nectary, the refi of the parts being uncertain; hence he takes occasion to point out the ufe of advertising to that organ, which before his time had been neglected, and which his opponents accuse him of sometimes making of too much importance. The great Juffieu will not, in this obvious cafe, ufe the language, though he adopts, unacknowledged, the idea of Linneus; nor will he allow the manifold neftes of fome of his RANUNCEAE (fee that article) to be other than petals. "Such," to use his own words, in his preface, p. 26, "is the love of undivided paffion!"

The nectary in RANUNCULUS, fays Linneus, is, in fome species, a naked pore; in fome it is bordered with a cylin-~
drical margin; in others clofed with a notched fcale. Ficaria of authors has only a three-leaved calyx, with a superabundance of petals. The ends in fome fpecies are roundifli; in others defpeffed, prikey, and fewer in number. R. hederaeeus has but five flamen; falcatus has a fivord-~
shaped point to each feed, and appendages to the base of the calyx; fereilater, and a few besides, have an awl-shaped receptacle, and confluently a fpiked fruit.

Eff. Ch. Calyx of five leaves. Petals from five to eight, with a honey-bearing pore in the calyx of each. Seeds naked.

This extenfive genus is divided into two fections, by the form of the leaves. The fpecies are all herbaceous, generally of an acrid quality. The prevailing colour of the flowers is yellow; we know of none that are blue, except by accidental variation in R. afaticus. They are plants of temperate or cold climates; none of them alpine. Linneus, in Sp. pl. ed. 2, enumerates twenty-eight fpecies; the 14th edition of Syll. Vegg. has forty-four, and Willdenow reckons up fifty-one. Fifteen are natives of Britain, as mentioned in Pl Brit.; but the 11th fpecies in that work, partulus of Linneus, mud be expunged, as a mere variety of biilfetus, n. 8. The original number is, however, made up, by a newly-discovered Scotifh fpecies, the alpgeflis, figured in Engl. Bot. v. 34. t. 2390.

So many additions have been made to this genus by the labours of Poiret in Lamark's Diét. v. 6, and the discoveries of Michaux and Pursh, that, with fome neceffary corrections, and a few communications of our own, the whole subject requires to be detailed.

Sect. 1. Leaves fimple and undivided.


more in diameter. The whole plant is of an excufively acrid burning quality, faid to produce inflammation in the vifera of sheep, whence the name flammula, a little flame. Dr. Withering recommends the distilled water, as preferable to all other medicines, for procuring inlantaneous vomiting in cafes of poison.

2. R. reptans. Creeping Spear-wort. Linn. Sp. pl. 773. Fl. Lapp. t. 198. v. 3. f. 5. Lightf. 289; fig. in frontifpiece to v. 1. Fl. Dan. t. 186.—Leaves linear-lan-~
ceolate. Stem creeping.—About the margins of alpine lakes, on a fandy soil; common in Scotland, flowering in June and July. We have always thought this a variety of the former, as mentioned in Fl. Brit.; but Willdenow contends for the contrary. He truly afferts that it differs in having a thread-shaped creeping stem; linear entire leaves, tapering down into their falkes; flower-falks folidary, erect, fingle-flowered; and much smaller flowers. Neverthelefs, we have feen to many intermediate varieties, and fuch a dipofition in weak plants of the Flammula to take root at their joints, that we molt incline to our original opinion, fuggestcd fift by Linneus himfelf in his Sp. Pl.

casionally ferrated, as in the rude cut of Ambrofius, but not commonly so. Calyx hairy. The whole herb is more or less covered with clofe-preffed hairs, visible also in Flammer. Flowers large and brilliant, very confpicuous.

pointed.

5. R. filiforms. Slender Creeping Crowfoot. Michaux Boreal-Amer. v. 1. 920. Pursh n. 4. Lamark Dict. n. 4.—"Stem thread-shaped, creeping, jointed, almoft naked. Leaves linear-awelked, obtufe. Flowers axillary, folidary, flalked."—In inundated places, on the banks of the river St. Lawrence; at Hudson's bay and Labrador; flowering in June and July. This is decribed as a very small, slender, smooth fpecies, very much refembning R. reptans, n. 2. We have feen no fpecimen.

K. Seeds  R.  llem-leaves  Petals  botanists  9.  2.  R.  the breadth, dere  3.  and  Tourn.  R.  123.  Jacq. (R.  Engl.  perhaps  feras  at  peren- 191.  Herb.  1179;  Stem  fomewhat  denfely  England  We  Fl.  long  tions,  fmall,  large  Leaves  Wulf.  woolly,  In  times  the  rinthia.  cal.  floivers,  lancelote,  very  rous  rather  moift  Curt.  Willd.  9.  335.  A  8.  be  last,  laft,  marks  leaves  of  of  the  last,  _R.  Jlem  6.  leaves  of  parnajfifolius.  have  have  fpecies  of  our  collection  the  root  is  diflinguifhed,  by  this  leaves  of  Culi.  10.  R.  spiciglofifoles.  Serpents-tongue  Crowfoot.  Wild.  n.  8.  (R.  ophioglofifoles;  Villars  Dauph.  v.  2.  731.  t.  49.)—Stem  simple,  erect,  leafy.  Lower  leaves  ovate,  or  heart-shaped,  many-rifed,  on  long  ifalks;  upper  linear-  lanceolate,  feifie. —Found  between  Toulon  and  Hyeres  in  Provence,  by  M.  Villars,  who  mentions  having  feen  a  drawing  of  the  fame  plant,  in  the  royal  collection  at  Paris,  marked  R.  lefius  paluftiris,  ophioglofifolis  t.;  Tourn.  Cor.  20.  The  root  is  defcribed  by  Villars  as  fomewhat  bullous,  or  tewous,  with  many  whorls  of  fibres.  Stem  erect,  a  foot  high.  Leaves  smooth,  rather  fefly.  Flowers  fmall,  yellow,  with  fhrining  petala.  Seeds  in  a  fmall  round  head.  He  conceives  it  to  fome  alluded  to  R.  Flamma.  The  refem- 2 3  3  8  ance  of  the  leaves,  in  his  plate,  to  parauffifolius,  feems  to  have  induced  Willdenow  to  range  it  here.  We  have  been  no  fpecimen.  11.  R.  amplexiaudius.  Pluffain-leaved  Crowfoot.  Linn.  Sp.  Pl.  774.  Wildl.  n.  9.  Ait.  n.  7.  Curt.  Mag.  t.  265.  (R.  folio  plantagineus;  Ger.  Em.  963.)—Leaves  ovate,  point- 6,  glaucous,  clafing  the  many-flowered  fim.  Root  facciu- 117.  —Native  of  the  Apennine  and  Pyrenean  mountains,  but  not,  as  far  as  we  know,  of  the  Swifs  Alps,  Haller  hav- 191.  ings  mistaken  his  n.  1179,  which  is  parauffifolius,  for  this  fpecies.  It  is  a  hardly  perennial  in  our  gardens,  not  difticult  of  culture,  yet  not  common,  flowering  in  May.  The  ber- 165.  bage  is  glaucous.  Stem  erect,  leafy,  twelve  or  fifteen  inches  high,  branched  above.  Leaves  generally  more  or  lefs  fringed  with  foft  hairs.  Calyx  green,  fMOOTH,  concave,  partly  mem- 183.  branous  and  white  at  the  edge.  Petals  of  a  pure  and  brilli- 202.  ant  white.  Authors  yellow,  as  in  other  fpecies.  We  have  never  seen  the  ripe  feeds.  12.  R.  heterophyllus.  Various-leaved  Slender  Crowfoot.  (R.  bonarienfis;  Lanarcf  Dict.  n.  9.)—Leaves  talked,  toothed,  heart-shaped  or  ovato-lanceolate,  with  three  central  ribs.  Stem  erect.  Flowers  talked,  foltary,  oppofite  to  the  leaves.  Seeds  obtufe,  granulated.—Gathered  by  Com- 211.  meron at  Buenos  Ayres,  in  marthly  places.  Root  fibrous.  Stem  erect.  Flowers  talked,  foltary,  oppofite  to  the  leaves.  Leaves  alternate,  on  long  ifalks;  the  lower  ones  ovate,  or  heart-shaped;  the  upper  lanceolate,  or  ovate;  all  obtufe,  more  or  lefs  crefmate  or  toothed,  about  an  inch  long,  fMOOTH,  furcifiehed  with  three  central  ribs,  and  several  lateral  branching  veins.  Foutflarks  bordered  at  their  bafe;  the  lowermost  much  the  longest.  Flowers  very  fmall,  wiflim,  on  foltary,  ifraft,  fimple,  lateral  ifalks,  an  inch  or  an  inch  and  half  long,  oppofite  to  the  leaves.  Fruit  ovate  or  obovate.  Seeds  obtufe,  or  obovate,  rough  with  minute  points.  The  calyx  is  smooth  and  reflexed,  often  remaining  till  the  feeds  are  ripe.  13.  R.  rigelliformis.  Long-talked  Crowfoot.  Leaves  on  long  ifalks,  heart  or  kidney-shaped,  wavy  or  crefmate.  Stem  creeping,  thread-shaped.  Flowers  talked,  foltary,  oppofite  to  the  leaves.  Petals  ovate.  Seeds  obtufe,  dotted.  —Native  of  Chili  and  New  Granada.  We  have  fpecies  from  Matius  and  Cavanilles,  but  this  fpecies  does  not  fex  to  be  any  where  decribed.  The  flemens  are  long,  thread- 165.  shaped,  much  branched,  proftrate,  creeping  or  perhaps  floating,  fending  out  from  each  joint  long  fibrous  radicles,  and  one  or  more  smooth,  roundifh,  heart-shaped  or  kidney- 173.  shaped  leaves,  hardly  an  inch  wide;  their  ftockflarks  meafuring  from  two  to  three  inches.  Flowers  very  fmall,  white,  foltary,  oppofite  to  the  leaves,  on  slender  ifalks,  rather  longer  than  thofe  of  the  foliage.  Stamens  few.  Fruit  rather  oblong.  Seeds  obovate,  obtufe,  comprefified,  minutely  dotted.  This  _Ranunculus_  is  perhaps  molt  nearly  akin  to  our  British  _bederaceus_,  hereafter  defcribed,  though  very  certainly  diftinct,  and  as  the  fpecies  are  at  precent  arranged,  they  muft  remain 3  G  2  at
at a distance. In habit and general resemblance they closely accord.  
14. R. Cymbarius. Small Trailing Crowfoot. Pursh n. 5. "Leaves heart or kidney-shaped, with five blunt teeth. Stem creeping, thread-shaped. Flower-flakes solitary, 
mottied two-flowered. Petals linear. Fruit oblong."—In 
famine marshes, near the salt-works of Onondago, New York, 
flowering in June and July. Perennial, somewhat reminding 
the following. Flowers small, pale yellow, sometimes 
white. Pursh. 
15. R. fulviglaucescens. Salt-marsh Crowfoot. "Pallas's Tra- 
vels, small edition, v. 3. 173." Wild. n. 12. (R. rutheni- 
cus; Jacq. Hort. Vind. v. 3. 19. t. 21. R. repens, flore 
caule singulare, foliis variis feccis; Amm. Ruth. 81. t. 13. 
f. 2.)—Leaves ovate, somewhat heart-shaped; toothed at 
the extremity. Stem creeping, thread-shaped. Flower-
flakes solitary, mostly single-flowered. Petals obovate. 
Fruit nearly globose.—Found by Gmelin, on the banks of 
the Neva; by Pallas in the salt plains of Siberia, 
beyond the lake Baikal. The flowers are yellow, as big as 
our common Crowfoots, being more than ten times the 
fize of the last. Their petals are about ten, obovate. The root 
fends out long runners, like a garden strawberry. Gmelin's 
specimen is much smaller than Jacquin's figure. 
Wildl. n. 10. Ait. n. 8. (R. inulaceanus; Ded. Pempt. 429. 
R. autumnalis Chitt.; Ger. Em. 1544. R. inulaceanus Chitt.; 
ib. 955.)—Leaves ovate, serrated. Flower-flakes radical, 
single-flowered, hairy. Native of Portugal and the north 
of Africa, cultivated in England before 1640, but now 
fearfully seen. It flowers in May and June, and has a 
perennial fibrous root, more like Gerarde's fig. 10 than 11. 
Leaves all radical, flaked, ovate, ribbed and veiny, some-
what hairy, strongly and unequally serrated, an inch or an 
inch and half long; sometimes, according to Chittus, blif-
tered. Flowers yellow, on simple, hairy, upright, radical 
flats, three or four inches long. Petals more than five, 
narrow-obovate. The old authors delineate two kinds, 
generally supposed to be varieties, but which may possibly 
be species. We have not seen either, except in a dried 
state. 
17. R. Ficaria. Pilewort, or Leffer Celandine. Linn. 
Ruff. t. 21. Bulliard t. 43. (Chelidonium minus; Matth. 
Valgr. v. 1. 578. Fuchsl. Hilt. 867. Ger. Em. 816.)— 
Leaves heart-shaped, angular, smooth, stalked. Petals 
numerous.—Native of wafle ground throughout Europe, 
in moil, shady, or bulfy places, flowering in the early 
spring. Dr. Sibthorp found it common in Greece; and 
there can be no doubt of its being, as all botanists have 
judged, 

n. 13.—Radical leaves wedge-shaped, ovate, five-toothed at 

at the extremity; those of the stem seli-sel, palmate. Native 
of the alps of Siberia. Wildenow says he received this by 
the name of grachtis, meaning glatis, with which it agrees 
in the fize, and perhaps colour, of the flower, but is 
abundantly distinct in the leaves." Several Siberian 
unnamed specimens, in the Linnean herbarium, answer ex-
actly to Wildenow's description. The radical leaves are 
feral, flaked, between half an inch and an inch in length, 
smooth; rounded and entire at the base; abruptly and 
violently cut into broad blunt teeth, we might almost say 
lodes, at the summit. Stem erect, usually single-flowered, 
with two or three, alternate, self-sel, more deeply lobed, or 
palmate, leaves. Calyx brown, hairy. Petals five, inver-
versely heart-shaped, apparently white. The flower is so like gla-
cialis, that we cannot but suspect the difference of the leaves, 
however great, to be but casual. At any rate, they are 
sometimes so deeply cut, that this species might perhaps, 
without violence, have been placed in the following fection, 
next to glacialis. 
(Thora major et minor; Caner. Epit. 825. 826. Th. val-
denis, et montis Baldi; Ger. Em. 963. Pfeudo acuminum 
pardaliannes; Matth. Valgr. v. 2. 430.)—Leaves kidney-
shaped, abrupt, crenate, reticulated; the radical ones on 
long flats. Stems with one or two flowers. Braeas lan-
colate.—Native of the alps of Switzerland, Auffina, and 
Greece, as well as of mount Baldis, near Verona, flow-
ering rather early in summer. It is said to have been formerly 
in the English gardens, but has never fallen under our ob-
ervation. Root perennial, of thick, tapering, fleshy fibres 
or rather knobs. Stem solitary, smooth, simple, near a span 
high; terminating in one, rarely more, long-flaked golden 
flowers, about half an inch wide; its calyx-leaves lanceolate, 
coloured, smooth, like every other part of the plant. Leaves 
at about two inches wide, and one long, rather coriaceous, strong-
ly reticulated with veins, nearly crenate, terminating either 
abruptly, with a notch, or elongated into three acute, entire, 
triangular, central lobes; the uppermoft, or floral, ones, 
lanceolate and entire; the radical ones only on long slender 
flats. Flowers globular, of a few, large, tumbid, ovate 
sects, with hooked points. The root of this plant is reported 
to be extremely acrid and poisonous, its juice having been 
used formerly, by the Swifs hunters of wild beasts, to en-
venom their darts, whose wound by that means becomes 
speedily fatal and incurable. Hence the name, from ᶜ浬>, 
corruption, or venem. We can see no possible reason for dis-
tinguishing the greater and smaller kinds, even as permanent, 
or well-marked, varieties. 

Section 2. Leaves dissected and divided. 
Wildl. n. 15. Ait. n. 11. (R. creticus latifolius; Chitt. 
Hilt. v. 1. 239. Ger. Em. 853.)—R. macrophyllus; 
Desfont. Atlant. v. 1. 437. Lamarck Dict. n. 19.—Radic- 
als leaves kidney-shaped, crenate, somewhat lobed; tem-
leaves in three deep, lanceolate, entire segments. Stem many-
flowered.—Native of Crete; cultivated in the Oxford 
garden in 1658, but perhaps now lost. The root is perennial, 
of many thick, tapering, fleshy fibres. Stem thick, mod-
erateley branched, eighteen inches, or more, in height, hairy 
as well as the rest of the herbage. Radical leaves from two to 
four inches long, and more in breadth, kidney-shaped, reticu-
lated with strong veins, light green, downy, unequally di-
vided into about seven, three-clift, or coarsely notched, shal-
low lobes; flem-leaves alternate, in three deep, oblong, ob-
tate, entire lobes; the base tapering or wedge-shaped. 
Flowers feral, yellow, nearly as large as R. Linnis, n. 3. 
Calyx reflexed, ovate, loosely hairy. & appears, by the ac-
count of M. Desfontaines, to differ merely in having the 
lower
lower leaves more deeply lobed than usual, and somewhat less hairy.

21. *R. caffiuscens*. Callabian Crowfoot. Linn. Sp. Pl. 775. Wild. n. 16. Ait. n. 127. (R. aconitifolius, folio rotundato, ad radicem praeflante; Loef. Pruf. 225. t. 72.)—Radical leaves roundish-heart-shaped, crenate, undivided; stem-leaves in several deep, lanceolate, toothed and jagged segments. Stem many-flowered. —Native of Prussia and Siberia, flowering in May. Loddiges are said to have introduced it into England, in 1754. Though the character of this approach the bull, the two plants are very different. The radical leaves of the present, though heart-shaped, are almost orbicular, their two lobes meeting each other; their margin simply crenate, but not at all divided; their surface minutely downy. Stem much branched; smooth below; downy above; bearing several fingered, veiny, smooth, fleshy leaves; the lower ones largest, many-lobed, and jagged; the upper with only three lanceolate, entire lobes. Flowers rather small, deep yellow. *Calyx* hairy towards the base. 

22. *R. auriculus*. Wood Crowfoot, or Goldlocks. Linn. Sp. Pl. 775. Wild. n. 17. Ait. n. 13. Pursh n. 9. Fl. Brit. n. 5. Engl. Bot. t. 624. Curt. Lond. f. ac. 2. t. 41. Fl. Dan. t. 665. Ger. Em. 954. (R. primus folyvstresc; Fuch. Hift. 156. Dalech. Hift. v. 1. 1299.)—Radical leaves kidney-shaped, deeply three-cleft, crenate; stem-leaves divided to the base into linear segments. Stem many-flowered. Calyx coloured. —Native of woods and shady places, throughout Europe; also in Pennsylvania; flowering in April and May. *Root fibrous, perennial.* Herb of a pale pleasant green, and deitiute of the acrimony usual in this genus. Stems a foot high, erect, branched, scarcely downy, except near the top. Leaves generally a little downy; the radical ones on long stalks, deeply divided into three or five, wedge-shaped, crenate, or cut lobes; the rest in many linear, entire, or partially cut, spreading divisions. Flowers terminal, erect, solitary at the top of each branch, of a bright golden hue. Calyx pale yellow, hairy, scarcely at all reflexed. *Nectary* a naked pore in each petal, not cloved by any scale. In cold backward seasons the petals are sometimes wanting, or rather identified with the calyx, which is then dilated, and more coloured than usual.

23. *R. abortivus*. Small-flowered Virginian Crowfoot. Linn. Sp. Pl. 776. Wild. n. 18. Ait. n. 14. Pursh n. 6. —Radical leaves heart-shaped, undivided, crenate; lower stem-leaves pedate; upper in three deep linear segments. Calyx reflexed, coloured. Petals oblong. —In wet places, by the sides of ponds and ditches, from New York to Carolina, flowering in July and August. Pursh. In ponds at Buenos Ayres. Commerson. This species appears to have been cultivated in Chelsea garden 100 years ago, but it has, long since, disappeared, nor has any author given a figure of the plant. Its habit is most like *federatus*, n. 26. *Root perennial,* of many long fibres. Herb smooth. Stem from six to eighteen inches high, branched, leafy. Radical leaves like those of a violet, not an inch long, crenate, smooth; their stalks two inches, or more, in length; lower stem-leaves ternate, their lateral leaflets deeply divided, all cut or crenate: uppermost leaves nearly sibbly, in three deep, lanceolate, entire divisions. Flowers small; yellow according to Pursh, but Commerson, in his MSS. calls them flesh-coloured; each stands on a simple solitary stalk, half an inch or an inch long, either from the forks of the branch, or at their junctures. The calyx is reflected, large, membranous and coloured. We find scarcely any certain traces of petals, but the plant may be variable in those parts, like *aconitas*. *Stamen* few. *Germen* large, globule. —Linnaeus took his specific character, caule rudiforme, from specimens not fully grown; yet he had an authentic one by him, with above thirty flowers. In Commerson's the upper leaves are more flaked than usual.


25. *R. trilobus*. Three-lobed Barbary Crowfoot. Def. font. Atlant. v. 1. 437. t. 113. Wild. n. 19. Stem erect, much branched. Leaves smooth, deeply three-lobed, cut; uppermost linear, obtuse, undivided. Seeds compressed, tuberculated.—Gathered by Desfontaines, in moist fields, near Mayane, in Barbary. He describes it as akin to *R. parviflorus*, except in its upright growth, and smooth, deeply three-lobed leaves. The lowest leaf of all is undivided and crenate. Flowers very small, yellow, situated as in the two last. Seeds in a round head, small, compressed, orbicular with a point, covered with tubercles on both sides. To us this species seems, by its seeds, allied to *parvulus* of Linnaeus, which is a variety of *binflus*, hereafter described.


27. *R. aconitifolius*. Aconite-leaved White Crowfoot. Linn. Sp. Pl. 776. Wild. n. 21. Ait. n. 16. Curt. Mag. t. 204. (R. inomatus quartus; alfo R. plo no flore: albo; Cluf. Hift. v. 1. 236. R. acaniti folio; Ger. Em. 954. R. albus multiflorus; ib. 957. R. albus, filo denfo; Baum. Hift. v. 3. 844, not 860.)—Leaves veiny, smooth, in five deep, pointed, toothed lobes; the middle one three-cleft: floral leaves fleshy, fingered, lanceolate, cut. Stem branched, many-flowered. —Native of the Alps of Switzer-land, France, Austria, &c.; a hardy and long-established perennial in our gardens, flowering in May and June; generally in a double state, as figured by Curtis. He remarks that it requires moisture, shade, and a pure air. The stem is one and a half or two feet high, partly purplish, smooth, with spreading branches. Leaves dark green, with a glau- cous hue beneath; the radical ones on long stalks; the rest nearly sibbly; all composed of more or less distinctly separate, often flaked, leaflets, strongly veined and coarsely toothed; the uppermost smaller, more simple, quite fleshy. Flowers;
Flowers white, three-quarters of an inch in diameter, not very ornamental in their single wild state, but much admired when double, and formerly called Fair Maids of France. Their pearly whitefens is enhanced by the violet calyx.

28. *R. plataniolus*. Plane-tree-leaved White Crowfoot. Linn. Mant. 79. Wild. n. 22. Ait. n. 17. Fl. Dan. t. 111. (R. albus, flore ampliss.; Lob. Ic. 668. R. alpinus albus; Ger. Em. 951.)—Leaves veiny, smooth, deeply palmate, five-lobed, cut and toothed; the middle ones three-cleft: floral leaves sessile, fingered, linear-awl-shaped, entire. Stem branched, many-flowered.—Native of the Alps of Germany, Norway, Switzerland, Italy, and of the Pyrenees, in shady places. Said to have been introduced into the English gardens in 1759, by Meffrs. Kennedy and Lee. This is very different from the last, with which Linnaeus originally confounded it. The leaves are larger, not divided quite to the base, though their lobes are more cut and jagged; the floral ones are remarkably long, slender, and entire. *Flowers two as large, and rather more abundant. Leaves of both have occasionally seven or nine lobes, instead of five.

29. *R. specicus*. Spike-fruited Crowfoot. Desfont. Atlant. v. t. 438. t. 115. Wildl. n. 23.—Leaves radical, five-lobed, toothed. Stem nearly simple, hairy. Fruit cylindrical, thrice as long as the calyx.—Gathered by Desfontaines in marshes at Algiers. *R. bulbiferum*, of numerous, oblong, fleshy, tapering knobs. Stem solitary, erect, a span high, hairy, simple, except at the top, where it divides into two or three simple fingle-flowered flanks; sometimes accompanied by a few *bracteas*, in three or four deep linear segments; sometimes naked. Leaves all radical, on hairy flanks, heart-shaped, rounded, five-lobed, strongly toothed, villous, about an inch and a half broad. *Calyx* of five ovate-oblong, coloured, hairy, spreading leaves. Petals five, obovate, yellow, the size of *R. acris*. *Fruit* cylindrical, slender, an inch and a half or two inches long. *Seeds* very numerous, ovate, comprefsed, bordered each with a hooked, prominent beak.

30. *R. paludosus*. Marsh Crowfoot. Poirié. Voy. en Barb. v. 2. 184. Linnac. n. 22. Desfont. Atlant. v. 1. 439.—"Downy. Lower leaves in three deep, many-cleft, fan-shaped segments; upper simple, linear, entire. Stem branched, many-flowered. Calyx erect."—Gathered by Poirié, in the borders of extensive marshes, near la Calle, and in some other parts of Barbary. *Root* fibrous, densely falcuated. Herb downy, with short, close-fledged hairs. Stem several, eight or ten inches high, with spreading leafy branches, bearing abundance of widely-spreading, deep-yellow flowers, the size of the foregoing, on slender flanks of various lengths. Radical leaves stalked; the earliest ones ovate, undivided, deeply toothed; the rest almost pinnate, with three long, narrow, deeply cut, fan-shaped segments; those on the lower part of the stem less compound; the uppermost linear, undivided, acute, entire. *Fruit* ovate, or almost elliptical, obtuse. *Seeds* oblong, smooth, compressed, scarcely pointed.

31. *R. illyricus*. Ilyrian Silky Crowfoot. Linn. Sp. Pl. 776. Wildl. n. 24. Ait. n. 18. Jaqc. Aurdr. t. 222. Ger. Dod. Pemplt. 428. Em. 953. (R. grumófod radice quarts; Cuf. Hift. v. 1. 240.)—Leaves flabby with silky hairs, linear-lanceolate, ternate, entire. Calyx silky, reflexed. Stem branched. Flower-flanks woolly.—Native of Hungary, France, Italy, Austria, Thrace, and of the Swedish isle of Oeland; cultivated here in Gerard’s time. Clusius received his specimens, from a physician of Ferrara, with the name of *R. illyricus*, which has been retained, abundantly enough, for a plant found in so many different countries, and for which so many expressive appellations might easily have been contrived. The root is perennial, composed of numerous, small, round granulations. Whole herb more or less clothed with flow-white, silky, or partly cottony, down. Stem a foot high, or more, somewhat branched, bearing several bright lemon-coloured flowers, nearly the size of *R. Lingua*, their calyx-leaves ovate, reflexed, externally silky. *Leaves* all linear-lanceolate, entire, seldom divided; the radical ones on long flanks, ternate or pinnate, those about the middle of the stem ternate, almost fiddle; upper ones simple, the usual length of each leaf or leaflet is two or three inches.—Dodonæus takes this for the second *Bázipheros*, or *Ranunculus*, of Dioscorides, with whose description it in some measure agrees. That species is said to be extremely acid. Hence Dodonæus, who is copied by Gerarde, supposes our plant may be the *Gelopóphylus of Pliny*, which cauòed those who took it to dye laughing. But this opinion depends on too many conjectures to deserve attention; even if any benefit could accrue from accepting the point. We must observe however that Dr. Sibthorp thought the above *Ranunculus* of Dioscorides to be our *languinofus*, which is a common Greek plant, and answers better to his description.

32. *R. falbelloïs*. Fan-leaved Crowfoot. Desfont. Atlant. v. t. 438. t. 114. Wildl. n. 25.—Sm. Fl. Græc. Sibth. t. 959. unpublished. (R. albiflorus, afflabilis radice; Column. Eschr. 312. t. 513.)—Radical leaves undivided or twice ternate, toothed or deeply cut, flaked; upper ones ternate or simple. Stem hairy, simple below, few-flowered. Fruit elliptical.—Found by Desfontaines, near Algiers, on moist uncultivated hills, flowering in winter: by Sibthorp on the northern mountains of Greece. *Root* perennial, of many oblong, tapering, chaffered frîbes, rather than knobs. Stem a span high, hairy, somewhat divided above, and bearing two or three yellow flowers, the size of our common *R. bulbiferus*, accompanied by deeply two or three-cleft *bracteas*. Leaves chiefly radical, on longish flanks; several of the earliest undivided, fan-shaped, strongly toothed; the rest deeply three-cleft, and subdivided.

33. *R. aflaticus*. Perian Crowfoot, or common Garden Ranunculus. Linn. Sp. Pl. 777. Wildl. n. 26. Ait. n. 19. Mill. Ic. t. 216. Sm. Fl. Græc. Sibth. t. 518. unpublished. (R. aflaticus, grumofad radice; Cluf. Hift. v. 1. 240—243. Ranunculi vari; Ger. Em. 958—960. i2/3,920.; Dioec. book 2. chap. 206.)—Leaves once or twice ternate; leaflets three-cleft, cut. Stem hairy, branched. Petals thrice as long as the calyx. *Fruit* cylindrical.—Found by Dr. Sibthorp wild in various parts of Asia Minor, but most plentifully in the isle of Cyprus, where it still retains one of its ancient names, mentioned by Dioscorides, ap2pil/2pilw, or Wild Parsley. In the gardens of Europe it has been cultivated, ever since the latter part of the sixteenth century, under the form of innumerable varieties, chiefly double, of every variegated hue. In a wild and single flate the large and splendid petals are of a most vivid crimfon, occasionally varying to yellow. The *root* is perennial, of numerous, brown, fleshy, tapering knobs. Stem twelve or fifteen inches high, erect, round, downy, hoary, leafy, branched from the middle to lower part, and bearing from three to five large long-flaked flowers, whose *calyx* is brown, hairy, and reflected, but one-third the length of the broad, obovate, concave petals. *Leaves* rather hairy, mottly flaked, variously three-cleft and notched, more or less compound; the floral ones, as usual, narrower and more fimple. *Fruit* cylindrical. *Seeds* oblong, with recurved points.

34. *R. japonicus*. Japan Crowfoot or Ranunculus. Thunb. Tr. of Linn. Soc. v. 2. 337. Wildl. n. 27. (R. aflaticus;

36. R. glacialis. Alpine Hairy-cupped Crowfoot. Linn. Sp. Pl. 777. Fl. Lapp. ed. 195. t. 3 f. 1. Willd. n. 29. Alt. n. 21. Fl. Dan. t. 19. (R. montanus purpureus, calycy villosa, Felicis Paternz ; Bauh. Hill. v. 3. b. 846. Scheuchz. Alp. v. t. 399, and 139 t. 20 f. 1.)—Leaves ternate, three-cleft, cut, their segments elliptical. Stem nearly simple. Calyx very hairy.—Native of the highest alps of Lapland, Switzerland, Dauphiny, Germany, &c. in the neighbourhood or ice and snow, flowering in June and July. Root perennial, with very long strong fibres. Stem from three to six inches high, simple and naked in its lower part; leafy near the top, bearing one or two, very rarely three, flowers, on long, smooth falks. Leaves green, scarcely hairy, rather fFelcy; the radical ones more or less compound, on long falks; their segments broader, more elliptical, and blunter than in the former. Flowers large and handfome, of five broad, roundish, white petals, rose-coloured or purple underneath; the calyx purplish-brown, angulariy rough, with shining tawny hairs. When we contemplate the great diversity of subdivision in the foliage of this species, we are disposed to believe our Frigidus, n. 18, may possibly be a mere variety. Their flowers precisely agree, as well as their general habit.

37. R. Seguieri. Sharp-leaved Alpine Crowfoot. Villars Dauph. v. 3. 737. t. 49. Willd. n. 30. (R. Columna ; Allion. Pedem. v. 2. 50. t. 67. f. 3. 4. Wulf. in Jacq. Coll. v. 4. 345. R. alpinus epil folio, flos albo magnco ; Pont. Comp. 177. Seguier Veron. v. t. 490. t. 12. f. 2. 3.)—Leaves ternate; segments wedge-shaped, subdivided, dentifere, acute. Stem branched, about three-flowered. Calyx smooth.—Native of mountain Baldus, where it was first found by Pontedera; as well as of the mountains of Dauphiny, Piedmont, and Carniola; in snowy situations. This resembles some of the most luxuriant varieties of glacialis, but differs in the acute and decurrent segments of its leaves, as well as its smooth pale calyx; for Villars is incorrect in describing that plant as "externally downy." It is quite smooth, in his own and Allioni's specimens; the hairiness being confined to the top of the flower-falks, where it is very dense and conspicuous; while the same part in glacialis is smooth, up to the base of the hairy calyx. The petals, and even the calyx, are white. Villars is surely right in removing the fynonym of Columna, cited by Allioni, which we refer, with hardly any scruple, to fivelobatus, n. 3, a very different plant.

38. R. nivalis. Palmate Alpine Crowfoot. Linn. Sp. Pl. 778. Fl. Lapp. cd. 2. 195. t. 3 f. 2. Willd. n. 31. (Excluding the variety.)—Leaves palmate, five-lobed, spreading, entire; thssue of the item fellile. Stem single-flowered, smooth. Calyx hairy, half the length of the petals.—Found by Linnaeus in Lapland, by the alpine ri-vulets on the snowy mountains of that country. Martens had previously gathered it at Spitzbergen. The root is fibrous, and fender. Stem simple, erect or ascending, smooth, fFaly, about six inches high. Radical leaves two or three, on long falks, heart-shaped at the base, rather deeply palmate, in five broad, divaricatcd, ovate, entire lobes, venous and quite smooth; fitem-leaves one or two, fellile, with five deeper, longer, more lanceolate lobes; the uppermost only three-lobed, or occasionally quite undivided. Flower solitary, on a long, terminal, hairy falk. Calyx of five ovate yellowish leaves, rough with black fih hairs. Petals yellow, ovate, twice the length of the calyx.

39. R. pygmaeus. Dwarf Small-flowered Alpine Crowfoot. Pursh n. 10. (R. nivalis pygmaeus; Linn. Fl. Lapp. ed. 2. 196. t. 3 f. 3. R. lapponicus ; Fl. Dan. t. 144.)—Leaves palmate, somewhat pedate, five-lobed, spreading entire; the upper ones almost fellile. Stem single-flowered. Calyx nearly smooth, rather longer than the petals.—Native of Lapland and Labrador. Perennial, flowering in May and June. Much smaller than the foregoing. Middle lobe of the radical leaves very deeply se-parated. Stem-leaves less perfectly fellile, and with narrower segments, than in nivalis. Flower not a quarter the size of this species; its petals yellow, roundish, scarcely fo long as the calyx, which is likewise small, and very fightly hairy.

40. R. montanus. Yellow Mountain Crowfoot. Willd. n. 32. Alt. n. 22. (R. nivalis ; Jacq. Aufr. t. 325, 326. Sibth. in Prodr. Fl. Græc. n. 1273 ? Villars Dauph. v. 3. 742. Cranzt Alluir. fasc. 2. 92 t. 4 f. 3. 4. R. n. 1168 ; Hall. Hill. v. 2. 71, excluding the references to Linnaeus. R. minimus alpinus luteus ; Bauh. Hill. v. 3. 842, two upper figures.)—Leaves five-lobed, rounded, cut; thfssue of the item fellile, with deep, lanceolate, entire segments. Stem single-flowered, rough with erect hairs. Calyx hairy.—Very abundant on the alps of Switzerland, Dauphiny, and Germany; not of Lapland. It was one of those many alpine plants, introduced into the English gardens in 1775, by a perfon bent on purpose to collect them, at the expense of Dr. Fothergill and Dr. Pitcairn. This species has been confounded with the Linnæan nivalis, by all writers previous to Villdenow; yet they are truly distinct. The montanus has remarkably long, subdivided, tubercous roots, with very long strong fibres. Stem hairy throughout, the hairs erect; sometimes quite leaffles. Lobes of the radical leaves un-
equally cut and toothed, not entire. *Calyx-leafs narrower, and leafs hairy. Petals larger, and of a deeper yellow. This is the *nivalis of most botanists, few having seen the true Linnean Lapland plant. The variety of montanus with a leaflets *flens, figured in Jacquin's t. 326, at the right hand, was taken for a new species, and called *acuta, by Favrod and Reyner, as appears by their dried specimens.

44. R. montanus. Gouan's Pyrenean Crownfoot. Wild. n. 33. (R. pyreneus; Gouan Illutr. t. 17. f. 1, 2.)—Leaves five lobed, rounded, cut; those of the *flens, deeply palmate; the uppermost with acute, entire lobes. Stem single-flowered, rough with deflexed hairs. Calyx hairy.—Gathered by Gouan on the Pyrenees, where it flowers soon after the melting of the snow. We have a specimen from the late M. Bruznonnet. This is a larger plant than the preceding, especially in its *flora, and differs, as Willdenow remarks, in having the *flens-leaf toothed or cut; but that character applies only to the lower one. The upper *flens-leafs, if there be more than one, confit of entire, acute lobes. The most decided mark of distinction appears to us in the hairs of the *flora, below the leaves, which in Gouan's plant are either widely extended or bent downwards; in the montanus the hairs of every part of the *flora are erec or clof-preffed. To this no perfon has hitherto adverted.

42. R. alpestris. Alpine White Crownfoot. Linn. Sp. Pl. 778. Wildl. n. 34. Ait. n. 23. Sm. Tr. of Linn. Soc. v. 10. 343. Engl. Bot. t. 2390. Jacq. Altr. t. 110. (R. n. 1167; Hall. Hift. v. 2. 71. R. montanis species prima et secunda; Cluf. Hift. t. 1. 234. R. montanus, flore minore, & majore; Ger. Em. 964. R. minimus alpinus albuns; Baulh. Hift. v. 3. 845; two lower figures.)—Leaves very smooth; radical ones somewhat heart-shaped, obtuse, in three deep, lobed segments; *flora-leaf lanceolate, entire. Stem mofily single-flowered.—Native of the highest alps of Austria and Switzerland, and of the mountain of Clova, in Anguifhire, Scotland, in which last place it was discovered by the late Mr. George Don, by the sides of little rills, flowering, though sparingly, in the spring of 1809. The *roots are perenial, with long fibres. Whole herb very smooth, and rather glaucous. Stem erec, from one to four inches high, almost always simple and single-flowered, naked, except one or two simple, linear-lanceolate, obtuse, entire leaves, apparently of the nature of *brachys. Radical leaves several, *flained, in three deep, subdivided, acute lobes. Calyx-leafs oval, smooth, edged with white. Petals of a pure and brilliant white. Haller fays this is one of the most acute of its tribe, bliftering the "flora; and yet the alpine hunters chew it, by way of refainment.

43. R. lapponicus. Long-flaked Lapland Crownfoot. Linn. Sp. Pl. 778. Fl. Lap. ed. 2. 194. t. 3. f. 4. Lapland Tour, v. 1. 156, 252.—Leaves smooth, in three very deep, oblong, pendent, notched lobes. Flower-flasks elongated, naked, single-flowered. Petals the length of the smooth calyx.—This rare species, not known out of the limits of Lapland, was discovered by Linnæus in two or three different places, near the river Juchtan, flowering in June. Professor Swartz also gathered it, many years after, near Lulua. It grows in watery situations, and is very different from all others of this genus. The aspect of the plant, at first fight, recalls the idea of Adoxa Mosa ohottellina. The *root is long, thread-shaped, and creeping, throwing up here and there, from its joints, a little, short, simple, solitary, smooth *flora, sometimes an inch or two high, sometimes scarcely distinguishable. Leaves one from the base, and another from the top, of the *flora, on slender, weak foot-flaks, two or three inches in length; each leaf an inch or an inch and half wide, smooth, veiny, rather fleihty, some what kidney-shaped, in three very deep, almost distinct, broad wedge-shaped lobes, having a few broad and rounded, blunt notches, each tipped with a minute glandular point. Flower-flaks from three to five or fix inches high, terminating the *flora, solitary, simple, naked, smooth, each bearing a small yellow flower, scarcely half an inch in diameter. *Calyx of three elliptical, concave, smooth, pale, reflexed leaves. Petals five or fix, obovate, ribbed, about the length of the *calyx; their nectarary closed by a scale. *Stamen from nine to twelve. Petals from fix to twelve. Seeds in a round ovate, smooth, with strongly recurved points.

44. R. hyperboreus. Arctic Crownfoot. Retz. Scand. ed. 1. Wildl. n. 26. "Rottb. in Copenh. Tranf. v. 10. 458. t. 4. 16." (R. Fl. Dan. t. 331, excluding the fynonym of Ammann, which belongs to *salpiglosus, n. 15. R. n. 50; Gmel. Sib. v. 4. 204. t. 83; b, excluding the Linnean fynonym.)—Leaves smooth, in three deep, divaricated lobes; the lateral ones cleft. Stem creeping. Flower-flaks the length of the leaves. Petals scarcely longer than the smooth calyx.—Native of Iceland, Greenland, Norway, and Siberia, in watery places. Gmelin and Linnaeus confounded this with *hederaceus hereafter mentioned; Gunner mislabeled it for *salpiglosus, which he called R. Ammanni, Fl. Norv. n. 826. From both, as well as from *salpigonius, it is very distinct. The *floras are long and creeping, or floating, throwing out from each joint, several simple, very long, fibrous radicles, with a flaked leaf, not a quarter the size of *salpiglosus, whose lobes are by no means toothed or cleft, the lateral ones only being simply cleft. The flowers are small, pale yellow, solitary, each on a lateral, not axillary, *flora, whose length is about equal to the adjoining leaf with its foot-flak. *Calyx-leafs only three or four, smooth, coloured. Petals about the same number, and scarcely longer, obovate. Seeds ovate, gibbous, with a hooked, but very short, beak.

45. R. montepellionis. Montpellier Crownfoot. Linn. Sp. Pl. 778. Wildl. n. 37. (R. saxatilis, magnlo flore; Bauh. Prodr. 96. Sauv. Monp. 181.)—"Leaves in three deep, cleft segments. Stem simple, villous, nearly naked, single-flowered."—Native of rocky places about Montpellier, according to Bauhin, who thus describes his plant. "Root compofed of long capillary fibres. Leaves from the root several; on long, somewhat woolly, *flanks, each leaf hardly so broad as the nail, in three small segments, which are again divided into two or three acute ones. The *flora is about three inches high, slender, woolly, bearing one large flower, of a brilliant golden yellow, compofed of five petals, with many reddish *flamines." We know no authentic specimen nor figure of this plant. Linnaeus has marked it as never seen by him; but a specimen sent him by Gouan, from the Pyrenees, marked R. alpinus humilis, magnlo flore, which we have been dipofed therefore to confider as R. Gouani, n. 41, affwrs very well to Bauhin's defcription, and it is not improbable that these suppoled two species are one and the same. Yet Poiret, who profefles to have gathered R. montepellionis at Montpellier, and in Barbary, speaks of them as distinct, though, it must be confef ted, his defcription is hardly sufficient to establish the point in dispute.

cylindrical. Seeds compressed, with straight beaks.—Native of low meadows, from Canada to Pennsylvanla, but rare, flowering in July and August. This species was sent by professor Thunberg, in 1781, to Kew garden, from whence we procured a specimen the same year. Mr. Aiton makes it biennial; Jacquin and Pursh perennial. The stem, like the footstalks, is very hairy. Whole herb of a light green, two feet or more in height, branched, many-flowered. Leaflets one and half or two inches long, strongly veined, with spreading segments. Flower-footstalk terminal, long-fibrous, furrowed, rough with close-prehensile hairs. Flowers small, their little, round, yellow petals not so long as the calyx, which is smooth and bent downward. Seeds in a cylindrical head, numerous, ovate, gibbous, compressed, smooth, very minutely dotted, each tipped with a short, sharp, erect, or slightly flexed, beak. Reception hairy. Mr. Pursh's description does not, in every circumstance, answer to the Linnean plant; for the flowers are not near so big as R. acris, nor are their footstalks round.

47. R. ternatus. Ternate-leaved Japanese Crowfoot. Thunb. Jap. 241. Willd. n. 39.—"Calyx reflexed. Leaves all ternate; leaflets three-cleft. Stem many-flowered."—Native of the Japanese island of Nipon, flowering in May. Nothing more is known of this species, concerning whose peculiar characters, or affinities, we can form no precise opinion.

48. R. bicornatus. Twice-ternate Magellanic Crowfoot.—Leaves smooth, twice ternate, cut; segments ovate, acute. Stem creeping. Stalks single-flowered, the length of the leaves. Petals obovate, the length of the smooth calyx.—Gathered by Commodon, in the strata of Magellan. No author appears to have taken up this species, of which a specimen, from Commodon's herbarium, was given by Thouin to the younger Linneus. The whole plant is smooth. The leaves bear a considerable resemblance to those of R. Seguieri, but are rather smaller, and distinctly twice ternate. The habit of the plant more accords with lapponicus and hyperboreus, however unlike at first sight. The stem is thread-shaped and creeping, seldom four from each joint, a few fibrous radicles, a pair of upright, flaked leaves, two or three inches in height, and one flower, whose footstalk naked footstalk is about as tall as the leaves. This flower appears to be extremely like that of lapponicus, though scarcely more than half so large. The dried petals have the same opaque whitenss as is observable in that species, and others, on their upper surface, and are probably yellow when fresh.

49. R. pedunculata. Long-footstalked Magellanic Crowfoot.—Leaves ternate, deeply cut, somewhat hairy. Stems hairy, taller than the leaves, two-flowered. Calyx reflexed, nearly smooth. Seeds globose, smooth, with recurved, hooked beaks.—Gathered by Commodon in the strata of Magellan, with the preceding. This has a general likeness to several common European kinds, which we shall next describe, but is essentially distinct. The radical leaves are several, on hairy footstalks, four inches long, their circumvallation roundish, measuring an inch, or inch and half, across; the leaflets almost always quite distinct, with short partial footstalks, their form wedge-like, or fan-shaped, more or less deeply cut, seldom regularly three-cleft. Stems several, erect, flaked, rough, with spreading hairs; simple and naked to the height of four or five inches, then dividing into two upright, hairy, simple flower-footstalks, greatly elongated, (from one to seven or eight inches), after flowering, and accompanied at their base by a solitary, flaked, deeply divided, palmate or fingered, leaf, an inch long. The flowers are much like those of bulbosus, or acris. Calyx leaves ovate, concave, reflexed, bearing a few external hairs. Petals yellow, wedge-shaped, fluted, nearly twice as long as the calyx. Fruit globose. Seeds globose, tumid, keeled, even and smooth; their beaks rather spreading, hooked at the tip.

50. R. bulbosus. Bulbous Crowfoot, or Butter-cups. Linn. Sp. Pl. 778. Willd. n. 40. Ait. n. 25. Fl. Brit. n. 7. Eng. Bot. t. 515. Pursh n. 12. Curt. Lond. fac. 1. t. 38. Mart. Ruff. t. 28. Ger. Em. 953. Lob. Ic. 666.—Leaves hairy, ternate, three-cleft, cut. Stem many-flowered. Calyx reflexed. Seeds compressed, smooth. Root bulbous.—Very common in Europe, as well as North America, in meadows and pastures, flowering throughout the summer. The root is a round, solid, perennial bulb, about an inch in diameter, increasing by offsets from the top, and sending out from its base many long stout fibres. Stems several, erect, a foot high, branched, leafy, round, hairy, many-flowered, destitute of trailing shoots or runners. Leaves flaked, variously cut, more or less hairy. Flowers terminal, solitary, on angular furrowed footstalks, rough with erect, bristly hairs. Calyx hairy, bent back to the footstalk. Petals nearly equal in size to R. longiflorus, a deep shining yellow. Nectary covered by a notched scale. Fruit globose. Seeds orbicular, greatly compressed, bordered, smooth, and even, tipped with a short blunt beak.—This is one of the most acid, and even caustic, species. Villars says the root may be used as a blister, instead of cantharides, but not so fatally. It is most active in the spring, and must not then be left on the skin more than four or six hours, for fear of leaving a dangerous spreading sore.

51. R. hirsutus. Pale Hair-y Crowfoot. Curt. Lond. fac. 2. t. 40. Fl. Brit. n. 8. Eng. Bot. t. 1504. Ait. n. 26. (R. Philomotis; Elh. Beitr. fac. 2. 145. Herb. 116. Willd. n. 41. Lamark Dict. n. 48. Pursh n. 13. R. fardous; Crantz Auffr. fac. 2. 84. Lamark Dict. n. 47. R. palillior; Villars Dauph. v. 2. 751. R. bulbosus; Hudson. Angl. 241. R. rectus folius pallidioribus, hirsutus; Banh. Hiff. 3. p. 2. 417. R. leucanthemus; Matl. Valgr. v. 1. 559. R. palustris; apii folio lanuginoso; Banh. Pin. 180. Morif. lect. 4. t. 20. f. 27 and 28.)—R. parvulus; Linn. Mant. 70. Fl. Brit. n. 11. Willd. n. 60. Ait. n. 31. Lamark Dict. n. 73. R. agrarius; ib. n. 46? R. mininus faxatilis hirsutus; Banh. Prodr. 96. R. mininus apulus; Column. Ecphr. 314. t. 316. f. 1.—Leaves ternate, notched. Stem erect, branched. Calyx reflexed. Seeds orbicular, compressed with a short ascending beak, bordered; tuberculated at the sides.—Native of moist ground, in various parts of Europe, from Britain to Greece, flowering from June to October. The root is fibrous and annual. Stem erect, generally much branched, leafy, spreading, many-flowered, fluted, clothed with soft, widely spreading hairs; in variety smaller, smoother and weaker, sometimes, in a very starved state, bearing but one or two flowers. Leaves on longish, more or less hairy, footstalks, pale green, hairy, ternate, varying much in size; their leaflets wedge-shaped, sometimes deeply three-lobed, sometimes only bluntly notched; upper ones narrower and more simple, nearly sessile. Stipulas membranous, hairy, somewhat dilated, attached to the base of the footstalks. Flowers on long, terminal, furrowed, hairy footstalks, solitary, smaller than in bulbosus. Calyx hairy, reflexed. Petals roundish; of a bright shining yellow above; paler and opaque beneath. Nectary closed by an abrupt scale. Fruit globose. Seeds lenticular, compressed, brown, with a triple-ribbed greenish border; their beaks short, ascending, very obscurely hooked; their fides fiddled with minute sharp tubercles, especially towards the margin, where they are often circularly arranged, as Poirier (or

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Lamarck) describes them in his *R. agrarius*, cited above.—This species has been very little understood. It is remarkable that any botanist should confound it with *bulbosus*, or with *federatus*, and that Mr. Curtis, in labouring to distinguish it, did not advert to the distinctive character of the tuberculated seeds, by which it approaches a very different tribe, hereafter described, consisting of *parviflorus*, *muricatus*, &c. Even Ehrhart has not noticed this circumstance. We are obliged to Mr. Edward Forrer, F.L.S. for tracing out the identity of *R. parviflorus* and *hirufus*, and we cannot but prefer Curtis's original name for the species, rather than Ehrhart's pedantic one of later date. On the account of priority *federatus* perhaps ought to have been retained; but this name is founded on a very dubious opinion, that the plant of which we are speaking caused the Sardonic laugh. Valerius Cordus, indeed, says it grows copiously in Sardinia, and it has certainly the appearance of Smallage, *Apium*; so far answering to the ancient history. But the account of Cordus seems taken from Dioscorides, whose "second *Ranunculus*" is more probably the Linnaean *lancinosus*, a still more general plant of the south of Europe than that of which we are speaking. After all, the famous Sardian herb, compared to Smallage, may be actually wild Smallage or Celerby, *Apium gravescens*, which is sufficiently acrid and poisonous to warrant our supposition, though it becomes sweet and wholesome by culture. In this uncertainty it is quite safe to call our plant *R. hirufus*.

52. *R. palustris*. Oriental Marsh Crowfoot. Linn. MS. (R. orientalis palustris, apii folio, caule subhirsuto; Tourn. Cor. 20.)—Leaves hairy, in three or five deep segments, bluntly notched, with rounded dilated sinuuses. Stem erect, branched, almost leafy. Calyx spreading. Seeds ovate, compressed, very smooth, with a short recurved beak. —Native of the Levant. An oriental species, with Tournefort's synonym, is preferred in the Linnaean herbarium, and named *palustris*, but we can find no mention of it elsewhere. This is certainly a most distinct species, though not taken up by any recent author. The root consists of many flabby knobs, tapering into fibres, and resembling thos of *R. aflatens*, though not so thick. Stem two feet or more in height; hairy below; much branched, and almost leafy above; the branches terminate. Leaves chiefly radical, on long hairy stalks; their outline somewhat pentagonal; heart-shaped at the base; hairy on both sides, about two inches wide; their three principal lobes spreading, deeply separated by wide rounded sinuuses, and notched unequally at the extremity with broad, rounded, abrupt teeth; the upper or floral leaves are small, short, linear, undivided. Flowers, as far as we can judge, yellow, not large. Calyx hairy, spreading widely, but rarely reflexed. Seeds in a round head, brown, shining, quite smooth, compressed, most like those of *bulbosus*, but more ovate, and with a longer, more recurved, and somewhat hooked, beak. Their edge is green, simple, not tripe-ribbed as in the last.

53. *R. polybractes*. Many-rooted Siberian Crowfoot. Wildl. n. 42. —Lamarck Dict. n. 38.—Radical leaves palish, with wedge-shaped, three-toothed segments; stem-leaves fleshy, fingered. Stems many-flowered. Calyx spreading. Seeds ovate, compressed, smooth, with a blunt beak.—Native of Siberia. Root fusciculated. Radical leaves like *R. federatus*, three-toothed; their lateral lobes two-toothed, wedge-shaped like the leaf itself, their segments bluntly three-toothed. Stem a finger's length, fimple, erect or ascending, two or three from one root. Stem-leaves fleshy, fingered, wedge-shaped at the base; their segments linear, bluish, entire. Flower-stalks two, three, or four, long, single-flowered, round, not furrowed, very finely downy like the stem. Calyx-leaves coloured, smooth, obtuse, spreading. Petals yellow, the size of *R. Flammula*. Fruit roundish. Seeds ovate, compressed, smooth, crowned with the permanent blunt stigma. Wild by. Now from the above description this species appears related, in many points, to the last, though they can hardly be the same.


55. *R. profusus*. Prostrate Crowfoot. Lamarck Dict. n. 35. Fl. Franconii, n. 5. 197.—Leaves ternate, three-cleft, very hairy. Stems entirely prostrate, creeping, zigzag. Calyx smooth.—Native of dry hilly places about Paris. Lamarck and Poiret cite this a distinct species from the last, not only because its herbage is much smaller and more hairy, but because the *flens* are, even when in flower, entirely prostrate. We have never met with any thing answering to this description in England. The flowers are said to be refractile *repens*, having likewise a smooth calyx. Our *repens* has hairs on that part.

56. *Q. intermedius*. Intermediate Crowfoot. Lamarck Dict. n. 44.—Lower leaves three-loved, cut; upper somewhat fingered. Flower-stalks mostly solitary. Calyx reflexed. Seeds compressed, smooth. Root fibrous.—Found at the borders of ponds in France, about Paris and at Fontainebleau. This plant, according to Poiret, is, as it were, intermediate between *bulbosus* and *repens*; having besides, many characters in common with *profusus*. The root is fibrous, fasciculated. Stems several, low, scarcely branched, almost leafless except at the bottom, weak, fricated, slightly downy, often forked above. Radical leaves on long stalks, almost smooth, in three rounded, often cut, lobes; the *fleaves* have three linear or lanceolate irregular lobes; the uppermost are very narrow, almost fingered. Flowers axillary, or terminal, two or three on each branch, on very long and slender, nearly smooth, stalks. Calyx-leaves reflexed at the time of flowering, as in *bulbosus*, coloured, concave, bearing some very fine long hairs. Petals of a fine yellow, fricated, middle-fingered. Fruit oval or globose. Seeds smooth, compressed, roundish, with a green border. We know nothing of this species but from the above description.

57. *R. lucidus*. Shining-leaved Crowfoot. Lamarck Dict. n. 36.—Leaves with three or five lobes, somewhat pinnatifid, shining, smooth. Stem erect, many-flowered. Calyx reflexed.—Support’d to be a native of the Levant; cultivated in
in the botanic garden at Paris. Root perennial. Stems one or two feet high, branched, leafy, very smooth, tender, striated. Leaves alternate, filched, widely spreading, smooth, shining as if varnished on their upper surface, divided into three or five dilated lobes, the lowermost constricted at their base, unequally cut, obtuse. *Petioles long*, somewhat downy; dilated at their base into a broad membranous expansion. Flowers numerous, situated at the ends, as well as in the forks of the branches, on long, simple, cylindrical, rather downy *flats*. Calyx leaves coloured, smooth, concave, reflexed after the flower expands. Petals rather large, roundish, of a fine shining yellow. This plant has some agreement with *R. repens*, from which it differs in having entirely upright *flames* and a reflexed *calyx*, as well as shorter more dilated lobes to the leaves. Such is Poiret's account. This surely cannot be our *polystylo*, n. 52, which has hairy leaves, and no resemblance or affinity to *repens*; neither could the intelligent author have overlooked Tournefort's eynomy for that plant.

58. *R. polyanthemos*. Many-flowered Crow-foot. Linn. Sp. Pl. 779. Fl. Suec. ed. 2. 196. Willd. n. 44. Art. n. 28. Lamarck n. 41. Lob. Ic. 666. (R. fylvefris fuscundus; Dod. Pempt. 427. R. fylvefris cauliscul; Ger. Er. 951, as to the figure. R. fylvefris; Tabern. Kreuter. 107. Ic. 42. R. nupellifolius; Crantz facc. 3. 90. t. 4. f. 1, 12) — Leaves in five deep, repeatedly subdivided lobes; segments all linear. Stem erect, many-flowered. Flower-flats furrowed. Calyx spreading. Seeds ovate, bordered, compressed, smooth. — Native of moor, elevated, rich meadows, in Upland, and elsewhere in Sweden, but rarely. *Lineatus*. In Germany, and perhaps in Switzerland, on the authority of various writers. Root perennial. Stem erect, two or three feet high, branched, many-flowered, leafy, clothed with upright, or somewhat spreading, hairs. *Radical* and lower *flaves* three inches wide, on long very hairy *flats*, divided to the very base into three lobes, the lateral lobes again divided almost to the base, so that the leaf may truly be called, in the strict sense, five-lobed; each lobe is deeply, more or less repeatedly, cut, into three- or four- or five-lobed segments, finely hairy on both sides, paler beneath: the uppermost leaves are nearly sessile, in about three deep, linear, entire divisions. *Flaves* long, terminal, angular or rounded, rough with upright hairs. *Flowers* large, yellow, drooping, not closing, in wet weather, according to *Lineatus*. Calyx spreading, pale, externally hairy. *Fruit globose*. Seeds ovate, short, compressed, smooth at the sides, bordered and roughish at the edges, tipped with a broad, short, recurved beak. We have described this from the authentic Linnaean specimen, which seems distinct from the following; and antlers extremely well to the figure of *Tabernamontanus* more especially, nor does it ill accord with that of Dodonaeus, reprinted in Gerard's herbal. The last-named author however certainly applies that figure to the common English *R. acris*, which he says he found double. Hence some doubt may arise whether the true *polyanthemos* was ever cultivated in England, as it seems to depend on Gerard's authority only for a place in Hort. Kew. We have never seen it alive. Possibly it may be found in a double flate in some old garden. The above description of the leaves, and the greater size of the whole plant, will distinguish it from *acris*. The *calyx* is hairy in both, notwithstanding Willdene's remark to the contrary.


60. *R. Breyninius*. Woolly-fruiting Alpine Crow-foot. Crantz Aultr. falc. 2. 91. t. 4. f. 2. (R. Breyninius; Brit. falc. 2. 91. t. 4. f. 2. — Native of meadows and pastures in all the more northern countries of Europe, very common in England, flowering in June and July. The double-flowered variety is frequent in gardens. The *root* is perennial, tuberous, with long simple fibres. Stem erect, two feet high, round, striated, rough with spreading hairs below, and with close-preted ones above, branched, slightly leafy. Leaves hairy, the leaflets very less divided than in the leaf, and with broader, wedge-shaped, by no means linear, segments: the upper ones linear, either deeply three- or five-lobed, or simple. *Flaves* round, not furrowed. *Calyx* green, spreading, hairy. Petals bright shining yellow. *Fruit globose*. Seeds much like the leaf. A dwarf alpine variety was brought by Mr. Dawton Turner from wet rocks, near the summit of Snowdon, whose *stem* is but three or four inches high, and bears but one or two *flowers*. This when cultivated in a garden gradually attains the size and habit of the common kind.

61. *R. lappaceous*. Bur Crow-foot. — Leaves ternate; leaflets flat, three-footed, sharply cut, hairy. Stem erect, many-flowered. Calyx spreading. Seeds ovate, keeled, erected, with elongated, revolute-pointed beaks. — Native of Port Jackson, New South Wales; communicated by Dr. White. This has much of the habit of *R. acris*, but is very distinct. The *flaves* are a foot, or more, in height, branched, roundish, rough with close-preted hairs. *Radical* leaves numerous, on long hairy *flaves*, very hairy, about the size of *acris* or *repens*, but remarkable for the partial *flaves*, sometimes an inch or two long, that support the leaflets, especially the terminal one; the leaflets are broad, wedge-shaped, more or less deeply three-lobed, coarsely and sharply cut. The lower leaves are narrower and less cut; the upper entire and lancelolate; the uppermost of all simple and linear. *Flowers* larger than in *acris*, white in the dried specimen, but perhaps yellow when fresh, finely veined, on long hairy, angular, terminal *flaves*. Calyx spreading, clothed with long hairs. *Nectary* covered with a wedge-shaped scale. *Fruit globose*. Seeds ovate, turgid, keeled, retraced with veins, smooth, each tipped with a prominent angular beak, nearly its own length, whose point is strongly recurved, and even revolute.

RANUNCULUS.

Italk round. Stem simple or divided. Leaves heart-shaped, three-lobed, toothed. —Native of Cappadocia. Root perennial, hard, the thickness of a goose-quill, and resembling the root of Doroicum. Radical leaves roundish-heart-shaped, with three very short lobes, all pointed, furrowed with a few coarse teeth, and clothed on both sides with scattered close-prepried hairs. Stem a flat high, clothed with close-prepried hairs, either simple, or divided above the leaf, each leaf flatly flowered. Corolla yellow, the fize of R. polyanthemos. Fruit roundish. Seeds compressed, hooked. Willdenow, from a drie specimen.

63. R. lanuginosus. Broad-downy-leaved Crowfoot. Linn. Sp. Pl. 779. Wild. n. 47. Ait. n. 30. Pursh n. 16. Fl. Dan. t. 397; Sm. Fl. Græc. Sibth. t. 519; unpubl. (R. montanus subfruticos latifolius; Bauh. Prod. 66. R. nemorosus hirtutus, foliis caryophyllaceæ; Loepr. Prutt. 220. t. 71. R. magnus valde hirtutus, flore luteo; Bauh. Hist. v. 2. 417. R. n. 1172; Hall. Hist. v. 2. 72. Boélly J. N. 90; Dioef. book 2. chap. 206.) —Leaves heart-shaped, five-lobed, lobed, toothed, filky. Stem erect, many-flowered, hairy. Flower-flawks round. Calyx spreadded. Seeds ovate, compressed, with elongated, revolute-pointed beaks.—Native of Germany, France, Switzerland, Carniola, Greece, and North America. Mr. Pursh observed it in old fields and meadows, from Pennsylvania to Carolina, flowering from June to October. Dr. Sibthorpe found it in shady watery situations in the Połonopneus, but most plentifully in the north of Greece, and with great reason concluded it to be the second Ranunculus of Dioscorides, with whose description it sufficiently well agrees, except being mild, rather than very acrid, in febile qualities, if we may trust modern authors. Linnæus distinguishes two varieties, between which we can discover no difference, and Haller unites them. The opinion of this great Swiss botanist however lobs some of its weight, by the doubt he expresses whether this plant be distinct from R. repens, n. 54; to which it has indeed a slight general resemblance, though differing very much in its upright stem, deflute of runners; its very soft filky leaves, by which this plant is known at once from every other European Ranunculus; and the revolute tare points of its seeds, which nearly agree with lappaceus in that respect; but the seeds themselves are compressed, and, as far as we can see, deflute of reticulated veins. The root is perennial, with many long, stout, cylindrical, fliy fibres, or perhaps slender knobs, intermingled with capillary branched radicles. Stem 12 or 18 inches high, branched, leafy, round, clothed with long, spreading or deflexed, hairs; its base purplish, as are also the long hairy footflawks of the radical leaves. These and the lower footflawks are three inches wide, divided about half way down into five or seven broad, sharply notched lobes, whose edges finish have a pale spot, with a purple vein, adjoining to their termination. The upper leaves are deeply three-cleft, with ovate and toothed, or lanceolate and entire, lobes. Flowers yellow, much like those of acris. Calyx hairy, spreadded. Fruit globose. Seeds with awl-shaped, strongly revolute beaks, by which this species is clearly distinguishable from repens, polyanthemos, acris, if such a mark were necessary, and by which it forms a chain of affinity between these species and our lappaceus. It is somewhat remarkable that R. lanuginosus has not been found in Britain, and still more so, that any obscurity should envelope the botanical history of so distinct a species.

64. R. sericeus. Silky Crowfoot. Lamark Dicét. n. 26. —Leaves ternate, very filky; leaflets wedge-shaped, deeply three-cleft, jagged and toothed. Stem erect, many-flowered, filky. Calyx spreadded. Seeds ovate, compressed, with short erect beaks.—Gathered in the ile of Bourbon by Commeron, from whom we have specimens. Roots, as well as the general habit and size of the plant, like the laft, but the whole herb is much more deeply clothed with hising filky hairs. The leaves are ternate, some of them almoft twice ternate; their lobes deeply and repeatedly cut, in a radiant manner, with sharp teeth. Flowers like the laft. Fruit ovate. Seeds with broad straight beaks, longer, and not so much curved or hooked, as even those of acris.

65. R. tomentosus. Shaggy Crowfoot. Lamark Dicét. n. 70. Pursh n. 17.—Leaves downy, three-lobed or notched, the uppermoft oval, entire. Stem reining, somewhat spreadding, shaggy, one or two-flowered. Calyx hispid, slightly reflexed.—Gathered in North Carolina, by M. Boce. A small, almost reining, very hairy plant, with fibrous roots. The flèmes are very low, and nearly prostrate, offending at their extremities, two or three inches long, tender, covered with whitith tufted hairs, difposed in two rows. Leaves flalked, thick, downy, generally with three lobes, which are either distinct or confluent; some leaves are merely crenate and rounded. Footflawks long and hairy. The uppermoft flèmes is fife, oval, acute, entire. Flowers one or two, on terminal, unequal, fimple flawks, clothed with two rows of hairs. Calyx hispid, a little reflexed. Petsal white or yellow, rounded at the end. Poiret. We have seen no fpecimen, nor did Mr. Pursh meet with the plant himfelf.

66. R. marylandicus. Maryland Crowfoot. Lamark Dicét. n. 69. Pursh n. 18. Leaves ternate, three-lobed, acute, cut, pale and nearly smooth beneath. Stem simple, almoft naked, downy. Calyx smooth, reflexed. Found in fhady woods, from Pennsylvania to Virginia, flowering from May to July. Purph. R. fibrus, perennial. Stems fimple, erect, downy, flender, about ten inches high; Poiret by miflake, as we preume, fays ten feet. Leaves radical, on long downy flawks, ternate; the two lateral ones opposite, flalked; all with three confluent, lanceolate, acute, cut lobes; their upperfe surface green; the under paler and whitith, almoft smooth. There are no other flèmes than what fland almost fiffle, at the base of the flower-flawks, and either have three or five fllow irregular lobes, or are fimpfly cut. Flowers two or three, terminal, on ftort, fcarcey downy, flawks. Calyx two or three, terminal, on short, white, downy, flawks. Petsals rather large, oval, rounded at the end, pale yellow. Poiret.

67. R. recurvus. Recurved Crowfoot. Lamark Dicét. n. 65. Pursh n. 19.—Leaves in three deep, acute, cut, wedge-shaped lobes. Stem many-flowered. Calyx and corolla reflexed. Petsals nearly linear. Seeds compressed, dotted, with revolute, awl-shaped beaks.—Native of fhady woods, from New York to Carolina; flowering from June to Anguit. Purph. We received fpecimen from the Rev. Dr. Muhlenberg, of Lancaster, Pennsylvania. The root is perennial. Stems a span high, very hairy; branched and leafy at the upper part. Leaves two or three inches wide, rather hairy, on very hairy flawks; their side-lobes for the most part deeply cloven. Flowers flalked, small. Calyx pale-purplish, ribbed, clothed with fine long hairs. Petsals small, narrow, almoft white. Fruit globose. Seeds ovate, lenticular, minutely dotted, smooth, with flender, revolute-pointed beaks.

68. R. septentrionalis. Smooth North-American Crowfoot. Lamark Dicét. n. 64. Purph n. 20.—Leaves ternate, membranous, smooth, deeply lobed, acute, cut. Stem two-flowered, hairy, like the bafe of the footflawks. Calyx reflexed.
Ranunculus.

reflexed. — Native of North America. Described by Poiret from Lamarck's herbarium, and adopted by Pursh.

Root perennial, fibrous, falciculated. Stems nearly simple, hollow, eight or ten inches high, almost leafless; downy in their lower part. Leaves falked, thin, smooth, composed of three falked leaflets, the central one having three deep spreading lobes, the others often but two; all sharp, cut and toothed. There is usually but one stem-leaf, which is nearly sessile, ovate, with narrow segments. Fossil leaves long, slender, more hairy towards their base. Flower-falkets two, terminal, unequal, very slender, smooth, each bearing, about half way up, one small linear leaf. Calyx reflexed, coloured, smooth, except a few terminal hairs, deciduous. Petals pale yellow, rounded. Fruit small, globular. Seeds nearly orbicular, lenticular, with sharp straight beaks. Poiret.

69. R. bispidus. Hispid American Crowfoot. Michaux Boreal-Amer. v. 1. 321. Lamarck Dict. n. 27. Pursh n. 21.—Very hairy, erect. Leaves ternate, sharply lobed. Stems few-flowered; leaflets below. Calyx close-prell. Seeds obovate, with awl-shaped, indented beaks. —Found in wet fields, and on the banks of ditches, from Virginia to Carolina, flowering from June to August. Root perennial. Flowers small, pale yellow. Pursh. A specimen sent by Gronovius to Linnaeus, as akin to his Languinopus, but distinct, anwsers very well to the characters of Michaux, and we have taken from that specimen the above account of the seeds. The flower is nearly as big as acris. Whole herbage, especially the fossil leaves, very hairy.


71. R. multifidus. Many-cleft Arabian Crowfoot. — Forsk. Ægypt.-Arab. 102. Lamarck Dict. n. 67. — "Leaves many-cleft; the lower ones pinnate. Stem many-flowered. Calyx the length of the corolla. Seeds ovate, acute. — Gathered by Forskall, in ditches near the town of Taes. He describes the stem two feet high, erect; round in the lower part; falked above; hairy. Fruit oval. We have no other authority, than the authors quoted, for this species or the last.

72. R. pedatifidus. Radiating-leaved Crowfoot. — Leaves deeply pedatifid, with linear, obtuse, divided or three-cleft, radiating, entire segments. Stem one or two-flowered. Seeds ovate, hairy, with small recurved beaks. — Native of Siberia. Four specimens from that country are in the Linnaean herbarium, but the species, though very distinct, appears never to have been described. Root perennial, of many long, cylindrical, falky fibres, and crowned with numerous capillary remains of old fossil leaves. Stem a span high, erect, round, falkated, leafy, falciform or divided, clothed with long, soft, lax hairs. Radical leaves on long hairy stalks, deeply cut, in a pedate manner, into five, seven, or more, narrow, linear, obtuse, elegantly radiating segments, some of which are deeply three-cleft, and their lobes again cleft, others merely divided, and others undivided; all entire at the edges, and somewhat hairy on both sides, with long, lax, white hairs. The fossil leaves are mostly falciform, leaflets divided; the uppermost in three, rarely more, deep, linear, falciform segments. Flowers apparently yellow, the size of R. acris. Calyx woolly at the base; its segments partly dilated and coloured, all shorter than the petals, and closely pressed to their under side. Fruit ovate. Seeds not very numerous, ovate, ovate, with short, awl-shaped, reflexed beaks.

73. R. echophyllos. Chervil Crowfoot. Linn. Sp. Pl. 780. Willd. n. 48. Lamarck Dict. n. 32. (R. teniolus luteus, grumosus radice, foraeantis feu italicus; Bar. t. 581? bad.)—Leaves thrice compound, with linear segments. Stem falky, with few flowers. Calyx reflexed, hairy. Root with tapering falky fibres. — Native of the south of Europe. The only certain specimen of this plant, that has ever come under our observation, exiils in the Linnaean herbarium. The root consists of numerous, long, falky, gradually tapering, downy falkets. Stem erect, about a span high, falkly, slightly falked, branched, bearing three or four flowers. Radical leaves falked, repeatedly ternate, with numerous linear, or somewhat lanceolate, entire segments, hairy beneath. Fossil leaves an inch and half long, falky; dilated, membranous, and ribbed at the base. Stem-leaves few, much leaved compound, and often nearly falked. Flowers solitary, on long, terminal, falkly, hairy, quadrangular stalks. Calyx strongly reflexed, coloured; externally hairy. Petals yellow. Fruit not sufficiently advanced to be described. At the back of this specimen Linnaeus has written Ranunculus hyberus, pulsatilla foliosa, T. Cor.; but there is no such page in Tournefort's Corolla, nor any thing to which it can refer; except R. lilius, pulsatilla folio, flore parvo, a species unknown to us. A very different plant from the true R. echophyllos, was given by the abbe Fourret to the younger Linnaeus, under that name. It seems rather to be filiformis, n. 52, a species allied, in many points, to what we are describing.

74. R. melefoliator. Milfoil Crowfoot. Vbl. Symb. v. 2. 63. t. 37. Desfont. Atlant. v. 1. 441. t. 116. Willd. n. 49. Lamarck Dict. n. 53. Sm. Fl. Grec. Sibth. t. 521, unpublished. (R. montanus leptomphyllum, asphodeli radice; Column. Ecphr. 312. t. 311.)—Leaves thrice compound, with elliptic-linear segments. Stem falkly, with few flowers. Calyx erect, somewhat hairy. Root with ovate knobs. — Native of Italy, Greece, Syria, and Barbary. The root, in Dr. Sibthorp's specimens, consists of many oval falky knobs, scarcely half an inch long, intermixed with fibres. Columna describes and delineates the fibres as terminating the knobs; a very material difference. The falkets, in the Greek and Italian specimens, are falkly and falked-flowered; in the more luxuriant ones from Aleppo and Tunis, somewhat branched, bearing two or three flowers. The falked leaves are more numerous, as well as more compound, than in the last. Flowers large. Calyx closely pressed to the corolla; sometimes nearly falked. Fruit oblong. Seeds with small recurved beaks. We can scarcely doubt, notwithstanding the above-mentioned diversity respecting the root, that the synonym of Columna belongs to the present, rather than the foregoing, species.

75. R. oxyfermus. Sharp-leaved Crowfoot. Willd. n. 51. Lamarck Dict. n. 37. — "Radical leaves oblong, obtuse, deeply and unequally toothed; stem-leaves falked, fingered, cut. Seeds awned."—Native of Siberia, near the river Terek. Root apparently annual. Radical leaves falked, ovate, obtuse, with unequal deep teeth; hairy, like their fossil leaves, on both sides. Stem erect, branched, hairy, a foot or more in height. Stem-leaves digitate; the segments of the lower ones unequally pinnatifid; of the upper linear and entire. Calyx reflexed. Corolla yellow, the size of R. bulbofas. Fruit elliptical. Seeds rather compressed, acule,
acree, with upright, awl-shaped, brily points. Will
deneu.

ments. Seeds prickly at each side. Stem erect. Frequent in corn-fields throughout Europe, flowering in the middle of summer. Roots fibrous, annual. Stem one or two feet high, much branched, many-flowered, leafy, nearly smooth. Leaves of a light green, slightly hairy, flaked, once or twice ternate, as well as deeply three-cleft; the ul
timate segments almost linear, entire, or rarely notched. Flowers small, lemon-coloured, flaked, lateral and terminal. Calyx spreading, hairy. Petals obvate, veined. Fruit devoided. Seeds very large, compressed, with erect, awl
shaped, hooked beaks; these seeds armed with numerous, prominent, awl-shaped prickles, largest towards the margin. From the observations of Mr. Brugn., this appears to be one of the most virulent of its genus, especially when young, causing speedy inflammation and gangrene in the stomachs of sheep and oxen; who nevertheless eat it with avidity. Vinegar much diluted with water, poured down their throats, proved a quick and certain remedy. The expression juice of the plant, given to dogs, is no lefs fatal.

luclus echinatus; Bauh. Hilt. v. 3. 846. Fumill. Peruv. 58. t. 18. f. 1.)—Leaves simple, three-lobed, notched, bluntish, smooth. Stipules dilately fringed. Seeds prickly at each side. Stem diffuse.—Native of watery places in various parts of the south of Europe; frequent in Greece. It occurs also in North America, in old fields, from Virginia to Carolina, flowering in June and July, ac
Journal Mr. Pursh. The root is annual, consisting of numerous long fibres. Herb smooth and succulent, with bright green. Stems several, various in length, spreading, and somewhat procumbent, leafy, rough, shining; purplish in the lower part. Leaves an inch and a half to three inches wide, three or three rather deep lobes, broadly and irregularly notched. Footstalks from one to four inches, or more, in length, with a concave sheathing base, bordered with a membranous stipula, whose edges are regularly fringed with dinted hairs. Flowers the size of the last, yellow, tolatary, on axillary flaks, rather shorter than the leaves. Calks reflexed, nearly, or quite, smooth. Petals obvate, almost twice as long as the calyx, at least in the European spec
mens, though they appear to be but of the same length in American ones. Fruit capitate. Seeds large, ovate, compressed, with broad, awl-shaped, angular, somewhat rec
urved beaks; these seeds covered with smaller, more uni
form prickles, than in R. arvensis. Commerson gathered, by the sea-shore at Monte Video, a variety of this with more luxuriant herbage, and smaller flowers, of which Ven
tenat makes a species of the name of ventriciosus, founding its character on the inflated bases of the footstalks, of which, however, we can see nothing in our original specimes from Thouin’s herbarium. Its stipulas are fringed precisely as in our European muricatus, to which we agree with Poiret in referring it, though we can fearlessly do the same by the following.

tus 7; Lamarck Dict. n. 75.)—Leaves simple, three
obed, notched, smooth. Stipulas bearded at the summit. Seeds prickly at each side. Stem erect, branched. Founded by M. Boé, near Charleston, South Carolina. This seems to differ from the last, in its simple, short, upright stem; but more especially, if Ventenat’s plate and description be correct, which we cannot doubt, in having each stipula crowned with a tuft of hairs, instead of being dis	antly fringed throughout. The petals are said to be larger than those of the American variety, at least of muricatus; but that circumstance is of small moment here, as to a spe
cific distinction.

79. R. parviflorus. Small-flowered Crowfoot. Linn. Sp. Pl. 780. Wildl. n. 54. Ait. n. 34. Fl. Brit. n. 13. Eng. Bot. t. 120. (R. hirundinus annuus, flore minimo; Rau Syn. 248. t. 12. f. 1. Pl. Phyt. t. 55. f. 1.)—Leaves simple, three-lobed, notched, hairy. Seeds covered, at each side, with hooked prickles; these beaks recurved. Stem diffuse. Native of the more temperate parts of Europe. Found on banks, and in wate as well as cul	ivated ground, in England, where the foil is gravelly; as also in Greece, flowering in the early part of summer. The root is annual. Stems prostrate. Whole herb hairy, smaller in every part than R. muricatus. Flowers-flalks opposite to the leaves. Petals pale yellow, feacely longer than the spreading calyx, fugacious, and often imperfect. Fruit capitate. Seeds ovate, with a broad, short, hooked beak, their flat brown sides densely covered with short, hooked prickles. R. trilobus, Desfont. Atlant. v. 1. 437. t. 113. Lamarck Dict. n. 77, seems a variety, not of this, but of our birfutus, n. 51.

drical. Seeds dotted; these beaks recurved and spinous.—Native of the Levant. Root annual. Stem various in luxuriance, silky, leafy; in the Linnaean species much branched and disarticulated, with many flower-surfaces, which are flaked, composed in general of three deeply laciniate, often punctuated, acute, hairy leaflets. Flowers large, pale yellow, on long, stout, simple, lateral or terminal, solitary, spreading flals. Calyx rather spreading than decidedly reflexed, nearly smooth. Fruit three quarters of an inch long, slightly elliptical, obtuse. Seeds in many rows, compressed, minutely dotted at each side, gibbous at the base, each terminating in a very broad, rather short, compressed, recurved, spinous-pointed beak. We know of no figure of this or the following.

81. R. grandiflorus. Large-flowered Oriental Crowfoot. Linn. Sp. Pl. 781. Wildl. n. 56. Lamarck Dict. n. 63. (R. orientalis, aconiti folio, flore luteo maximo; Tourne. Cor. 20.)—“Stem erect, two-leaved. Leaves many-cleft; those of the stem alternate, sessile.”—Gath
ered by Tournefort in the Levant. We have seen no speci
men. Willdenow marks this as a perennial species, and indicates his having seen it in a dried state. We regret that he did not subjoin a description of the plant, the Lin
næan specific character being very insufficient. What Peiret has given is evidently compiled from the short ma
terials furnished by Linnaeus and Tournefort. The Abbé Scèlin is said to have gathered R. grandiflorus near Confan	ineple; on whose authority it finds a place in Prodr. Fl. Grac. v. 1. 585.

WiUd.  
Leaves Jacq. capillary Ait. fides the our other England, zdly, Stem branched capillary all the (R. R. the Ait. tlieir Alt. the the inch immerfed, ereft. the Fl. Willd. 48. the Ger. 39. deeply the the Waldil. 83. 84. Native of the waters of Hungary. Annual. Stem nine inches high, erect ; branched in the upper part. Leaves that are under water very numerous, entirely covering that part of the stem, oblong, the length of the nail, each supported by a capillary footstalk an inch long ; the floating leaves small, wedge-shaped, three-lobed, entire, as long as the former, their footstalls thicker and shorter. Branches an inch long, erect, rising above the water, and bearing elliptical obtuse leaves, tapering each way, from four to six lines long, on short footstalks. Flowers extremely small, yellow. Willdow.

83. R. polyphyllus. Many-leaved Water Crowfoot. "Walfr. et Kitaibel Hung." Willd. n. 58. "Leaves under water oblong, flaked, capillary; floating ones wedge-shaped, three-lobed; those above the water elliptical. Stem erect." — Native of the waters of Hungary. Annual. Stem nine inches high, erect; branched in the upper part. Leaves that are under water very numerous, entirely covering that part of the stem, oblong, the length of the nail, each supported by a capillary footstalk an inch long; the floating leaves small, wedge-shaped, three-lobed, entire, as long as the former, their footstalls thicker and shorter. Branches an inch long, erect, rising above the water, and bearing elliptical obtuse leaves, tapering each way, from four to six lines long, on short footstalls. Flowers extremely small, yellow. Willdow.


85. R. aquatilis. White Floating Crowfoot. Linn. Sp. Pl. 781. Willd. n. 60. Ait. n. 37. Fl. Brit. n. 15. Engl. Bot. t. 101. Ger. Em. 829.—Leaves capillary under water; above somewhat peltate. Stamens numerous. Seeds corrugated.—Native of pools, ditches, and rivers, throughout Europe, mantling the surface with its copious white blossoms, in the early part of summer. The roots are long, fibrous, and perennial. Stems floating under water, long, round, branched, leafy. Leaves flaked, smooth; the uppermost floating, usually peltate, with various blunt notches; the next deeply three-lobed, or even ternate; the lowermost immerced, repeatedly three-eleft, with innumerable capillary segments. Flowers floating on long simple flanks, opposite to the leaves. Petals obovate, much longer than the calyx, white, with yellow claws. Nectary tubular. Stamens thirty or more. Fruit like the last, but the seeds more numerous, and generally bristly, somewhat obovate.

Varieties, as we deem them, of this species are, if, that whose leaves are all immersed, and entirely capillary, figured in Ger. Em. 827. f. 3.; 2dly, the circinatus of Sibth. Oxon. 175, figured in Phil. Phyt. t. 55. f. 2, whose leaves are all likewise in capillary divisions, but finer and smaller than the former: 3dly, the fluvialis of Willdow, n. 61, pecudanoides of Desfont. Allant. v. 1. 444, figured in Fl. Dan. t. 376, whose leaves are not only in capillary segments, but considerably elongated, by the influence, as we conceive, of the running water, in which this fort is always found. The seeds indeed are not bristly, in our specimens of this last variety, but naked, as in hederaceus, which species agrees with every variety of aquatilis, in the corrugations of the seeds, as above described.

We have thus added twenty-four species to Willdow's number, following his arrangement, for the present at least; not only for the convenience of our readers, but because it would be very difficult to make a perfect one on any known principles; the several species being allied by so many characters, and so dissimilar in others, that nothing could be more precarious than to seek the clue of nature through such a labyrinth. The seeds perhaps ought to form the basis of a specific arrangement, if they might not even lead to generic distinctions.

No small curiosity in the history of this genus is the R. alatus, of Poiret in Lamarec's Dict. n. 72, which, by his description, proves to be no other than Gymnophyles aquatilis of Jullieu. (See Gymnostyles.) The pinnula of Poiret, n. 82, appears to us a variety of aquatilis, growing in shallow, and perhaps fluctuating, waters; whence, though its leaves are all deeply cut, their segments are not quite capillary, but linear and oblate. We have Swifs specimens answering to this author's description.

RANUNCULUS, in Gardening, contains plants of the hardy, herbaceous, perennial kind, of which the species cultivated are, the Perian crowfoot, or garden ranunculus, (R. afatius); the aconite-leaved crowfoot (R. aconitifolius); the upright meadow crowfoot (R. acris); the creeping crowfoot (R. repens); and the embracing-leaved crowfoot (R. amplexicaulis). But there are other species that may be cultivated for variety.

Of the first species the varieties are exceedingly numerous, being sometimes divided into two classes, as the old Turkey-kinds, and the Perian kinds, the varieties of the latter amounting to many hundreds, and being considerably more various, rich, and beautiful in colour than those of the others.

But in the former of these kinds they arise with a strong generally unbranching stalk a foot high, terminated by one large double flower, sometimes emitting one or two smaller ones from its sides, and of which there are red-flowered, scarlet-flowered, yellow-flowered, and scarlet turban-flowered, &c.; but being seldom tinged with different colours, as in the Perian kinds.

And in the latter kind the plants rise eight or nine inches high, generally branching from the bottom, producing from five or ten to twenty or more flowers on each root, and of which there are single-flowered, semi-double-flowered, full-double-flowered, large and full like a double rose, being generally filled with petals to the very centre, forming a regular globular body, of admirable elegance, of all sorts of the most beautiful colours in different varieties, and of numerous degrees of deeper and lighter shades, tinges, and tints in the several colours. Indeed Martyn observes, that the varieties produced of late years from the seeds of semi-double flowers are unbounded; and that Mr. Mad-dock remarks that they are more numerous than of any
other flower. Accordingly his catalogue, he says, boasts nearly eight hundred, all with their proper names: ranged under the heads of — dark and dark purple; light purple and grey, &c.; crimson, &c.; red, &c.; roly, &c.; orange, &c.; yellow and yellow spotted, &c.; white and white spotted, &c.; olive, &c.; purple and coffee-striped, &c.; red and yellow-striped; red and white striped.

And according to the above flower gardener a fine ranunculus should have a strong straight stem from eight to twelve inches high. The flower should be of an hemispherical form, at least two inches in diameter, consisting of numerous petals gradually diminishing in size to the centre, lying over each other, so as neither to be too close nor too much separated, but having more of a perpendicular than horizontal direction, in order to display the colours with better effect. The petals should be broad, with entire well-rounded edges; their colours dark, clear, rich or brilliant, either of one colour or variously diversified, on an ash, white, sulphur or fire-coloured ground, or else regularly striped, spotted or mottled, in an elegant manner.

In the second species there is a variety with double flowers, which has been obtained by seeds, and is preferred in many curious gardens for the beauty of its flowers. It is by some gardeners called the Fair Maid of France. The root is perennial, and composed of many strong fibres; the leaves are divided into fine lanceolate lobes; the four fide-lobes are upon footstalks coming from the side of the principal stalk, and the middle one terminates it; they are deeply serrate, and have several longitudinal veins. The stalks rise a foot and half high, and branch out at the top into three or four divisions, at each of which there is one leaf, of the same shape with the lower, but smaller. The flowers are pure white, and very double, each standing upon a short foot-stalk. The flowers come forth in May.

In the third sort there is also a variety with double flowers, which is the most generally cultivated in the garden. It is frequently among other herbaceous perennials, under the name of Yellow Bachelor’s Buttons.

And in the fourth species there is a variety with double flowers, which is the most cultivated in the gardens for its ornamental effect.

Method of Culture. — The first sort and different varieties may be readily increased by the off-sheaves taken from the root, and new varieties may be raised from seed. In the first of these methods the off-sheaves should be separated from the roots in dry weather, in the latter end of summer, when the flowering is over, and the stems and leaves are declining, being placed in bags or boxes, in a dry place, till the autumn, when they should be planted out in rows six or eight inches apart, and fix of them to each, in separate beds, prepared with light sandy earthy compost, to the depth of two or three feet; taking care to protect them carefully from the frost during the winter. When the buds begin to break through the ground they should be kept perfectly clear from weeds, protecting them from frosts; and when they have flowered and the stems are decayed, the root should be taken up; cleared from dirt, and placed in bags or boxes till the autumn, when they must be planted again.

But in the second mode, the seed should be collected from the bolt plants of the semi-double kinds, and be sown in flat pans or boxes, filled with light rich earth, in August, covering it in about a quarter of an inch thick with the same sort of earth, placing them in a shady situation, so as to have a little of the morning sun. The pots should remain here till the beginning of October, when the plants sometimes appear, though it is often later before this happens, when they should have a more open exposure with the full sun; but when frost is apprehended, they should be removed under a common hot-bed frame, being only covered in the nights and bad weather with the glaases, guarding them well against rains and frost. In the spring following they should be exposed to the open air, being very lightly reseeded with water, having a situation to enjoy the morning sun; and when their leaves and stems begin to decay, the roots may be taken up, dried in a proper place, and then put up in bags to be planted out in the same manner as the old roots in October.

In the following summer they will produce flowers; when such as are good should be marked, and the others removed from them. The plants intended to flower should not be suffered to run to seed, as roots which have produced seeds seldom furnish fine flowers afterwards. The disappointments experienced in purchasing these roots, chiefly depend upon this circumstance.

It may be noticed that the roots intended for the borders should be planted towards the spring in little clumps or patches, three, four, or five roots in each, putting them in either with a dibble or trowel, about two inches deep, and three or four inches farther from each patch, and the patches from about three to five or ten feet distant, placing them in a varied manner in the borders.

And in regard to their general culture after planting, such of the forward autumn-planted roots of the choice sorts in beds as have shot above ground, should in winter, where convenient, have occasional shelter from hard frosts, by mats supported on low hoop arches; or in severe weather be covered close with dry long litter, removing all covering in open weather; and in the spring, when the flower-buds begin first to advance, shelter them in frothy nights with supported mats, suffering them, however, to be open to the full air every day; but the latter plantings, which do not come up in winter, or very early in spring, whilst frothy nights prevail, will not require any protection, and all those distributed in patches about the borders must also take their chance in all weathers; those of the different coloured plants will succeed one another in flowering from the beginning of April until the middle of June, though the May blow generally thaws to the greatest perfection. After the blow is past, and the leaves and stalks withered, the roots should be taken up and dried in the shade, then cleared from all off-sheaves and adhering mould, putting them up in bags or boxes till next planting season, when they must be planted again, as directed above.

But in each season of planting, it is highly necessary, in the principal fine varieties, to put them either in entire new beds, or the old ones refreshed with some fresh rich earth or compost, working the old and new well together, in order to invigorate the growth of the plants.

All the other species are capable of being easily raised by the roots, which should be divided or parted in autumn when past flowering, or in the spring before they begin to flower, and the slips be either planted at once, where they are to remain, or in nursery-rows for a season, then planted out finally. They succeed in any common soil and situation, and may be differed about the different flower-borders and clumps, where they constantly remain, only trimming them occasionally; and once in a year or two, or when they have increased into large bunches, taking them up in autumn or spring, to divide them for further increase, replanting them again directly.

In saving seed for raising new varieties, it must be suffered to continue on the plant till it becomes brown and dry,
dry, then be cut off, with the heads, and spread upon paper, in a dry room, exposed to the sun, and when quite dry, be put into a bag, and hung in a dry place till it is wanted.

All these plants are highly ornamental; the first fort in beds and pots, and the other in the borders, clumps, and other parts of pleasure-grounds.

**Ranunculus, Globes, in Botany.** See *Helleboræ.*

**Ranunculus Viridus, in Zoology,** the name of an animal common in many parts of the world, and usually known by the name of the tree-frog, or rana arborea.

The creature is easily distinguished from the common frog, by its being much smaller, and of a green colour. It usually sits upon the leaves of trees and shrubs, and makes a great noise in an evening; but that is rather like the fingering of a small bird than the croaking of a frog.

These creatures have been kept alive many years together in glafs vefvils, giving them flies and other small insects: and in winter, when these are scarce, they usually become very lean and feeble; but in summer, when they are plentiful, they will grow fat again, as if at their liberty. This is esteemed a poisonous creature. Ray. See Rana.

**Ranz des Vaches,** a celebrated air among the Swiss, played upon the bagpipe by the young cow-keepers on the mountains. The air will be found on our music-plates. In the article Music, the powerful effects of this tune are mentioned, from Rouleau’s Dict. de Musique.

**Racolonda, in Geography,** the title of a diamond-mine in Hindoostan, placed in Mr. Montefior’s map about 15 geographical miles to the west of Ralicotte, and 12 from the north bank of the Kifnath, but Mr. Rennell does not know what authority he has for this position. Tavernier, who visited Racolonda, gives its distance from Golconda at 17 gos, of 4 French leagues each. He crofled a river that formed the common boundary of Golconda and Vidafour; about 4 gos, or more, before he came to Racolonda; and this river can be no other than the Beemah, which to this day forms the eastern boundary of Vidafour, and passes about 80 or 82 miles to the west of Golconda, crofled from the road to it from Racolotta. If we reckon the 82 miles at 13 gos, that is, forming a scale from the distance between Golconda and the river Beemah, each goz will be 6.5 geographical miles in horizontal distance (or nearer three than four French leagues); and Racolonda will be placed about 25 geographical miles on the W. of the Beemah, or E. of Ralicotte.

**Racoon L’étaff,** a town of France, in the department of the Vogeis, and chief place of a canton, in the district of St. Die, on the Meurte; 7 miles N. of St. Die. The place contains 2528, and the canton 5500 inhabitants, on a territory of 70 kilometres, in 5 communes.

**Rouda, or Rounda, denoting gardens,** an island of Egypt, in the Nile, in front of Old Cairo, about 500 yards in breadth, where is built the *Meklaa,* signifying measure, or Nilo-meter, a pillar, by the gradations on which the rise of the Nile is measured.

This island is called Roudd, or gardens, because it is laid out in gardens, and inhabited only by gardeners.

**Raputty,** a town of Hindoostan, in Malwa; 20 miles N.N.E. of Tanda.

**Rapa,** in Botany, (an ancient name, of whose etymology no plausible account has come to our knowledge,) the Turnip. See *Brassica, species* 7.

**Rapaapo,** in Geography, a town of America, in New Jersey; 30 miles S. of Woodbury.

**Rapacious Animals,** in the general, are such as live upon prey.

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will. If the woman conceived, the law formerly esteemed it no rape; from an opinion, that she cannot conceive, unless she confented: but this opinion has been since questioned. Coke on Litt. li. cap. 11.

This crime, by the Jewish law, Deut. xxii. 25. was punished with death, in case the damsel was betrothed to another man; and in case she was not betrothed, then a heavy fine of fifty shekels was to be paid to the damsel's father, and she was to be the wife of the ravisher all the days of his life; without that power of divorce, which was in general permitted by the Mosaic law.

The civil law (cod. 9. tit. 13.) punishes the crime of ravishment with death and confiscation of goods; including under this crime both the offence of forcible abduction, and also that of forcibly disfavouring; either of which, without the other, is in that law sufficient to constitute a capital crime. And the fleeing away a woman from her parents or guardians, and debauching her, is equally penal by the emperor's edict, whether she consent, or is forced.

Rape was punished by the Saxon laws, particularly those of King Athelred, with death; which was also agreeable to the old German or Scandinavian constitution. Instead of this, another punishment was instituted by William the Conqueror, viz. castration and loss of eyes, which continued till after Bracton wrote in the reign of Henry III. But it was then the law, and still continues in appeals of rape, that the woman should immediately after go to the next town, and there make discovery to some credible persons of the injury she has suffered; and afterwards should acquaint the high constable of the hundred, the coroners and the sheriff, with the outrage; the time of limitation for this purpose was by flat. Wilm. 1. cap. 13. extended to forty days. But there is now no time fixed; for as it is now usually punished by indictment at the feet of the king, the maxim of law takes place, nullum tempus occurrit regi: however, the jury will rarely give credit to a flat complaint. During the former period it was also held for law, that the woman (by consent of the judge and her parents) might redeem the offender from the execution of his sentence, by accepting him for her husband, if he also was willing to agree to the exchange, but not otherwise.

In the 3 Edw. I. by the flat. Wilm. 1. cap. 13, the punishment of rape was much mitigated: the offence being reduced to a trepaps; if not prosecuted by the woman within forty days; and subjecting the offender only to two years imprisonment, and a fine at the king's will. But in the 13 Edw. I. it was found necessary to make the offence of rape felony, by flat. Wilm. 2. cap. 34. And by 18 Eliz. cap. 7, it was made felony without benefit of clergy; as also the abominable wickedness of carnally knowing or abusing any woman-child, under the age of ten years; in which case the consent or non-consent is immaterial, as, by reason of her tender years, she is incapable of judgment and discretion. Sir Matthew Hale is indeed of opinion, that such proficile actions committed on an infant under the age of twelve years, the age of female discretion by the common law, either with or without consent, amount to rape and felony, as well as incest, as before the statute of Queen Elizabeth; but the law has in general been held only to extend to infants under ten. A male infant, under the age of fourteen years, is presumed by law incapable of committing a rape; and, therefore, cannot be found guilty of it.

The civil law seems to suppose a prostitute incapable of any injuries of this kind; not allowing any punishment for violating the chastity of her who hath indeed no chastity at all, or at least hath no regard to it. But the law of England holds it to be felony to force even a concubine or harlot; because the woman may have forborne that unlawful course of life.

As to the material facts requisite to be given in evidence and proved upon an indictment of rape, we shall here only observe, that the party ravished may give evidence upon oath, and is in law a competent witness; but the credibility of her testimony must be left to the jury, upon the circumstances of fact that concur in that testimony: e. gr. if the witnesses be of good fame; if she professedly discovered the offence and made search for the offender; if the party accused fled for it: these and the like are concurring circumstances, which give greater probability to her evidence. But, on the other side, if the be of evil fame, and stands unreported by others; if she concealed the injury for any considerable time after she had opportunity to complain; if the place, where the fact was alleged to be committed, was where it was possible he might have been heard, and the made no outcry; these and the like circumstances carry a strong, but not conclusive, presumption, that her testimony is false or feigned. Moreover, if the rape be charged to be committed on an infant under twelve years of age, she may still be a competent witness, if the hath sense and understanding to know the nature and obligation of an oath; and, even if she hath not, it is thought by Sir Matthew Hale that the ought to be heard, without oath, to give the court information; though that alone will not be sufficient to convict the offender. And, indeed, it is now settled, that infants of any age are to be heard; and if they have any idea of an oath, to be also sworn: it being found by experience, that infants of very tender years often give the clearest and truest testimony. Blackst. Com. book iv.

The civilians make another kind of rape, called subornatio, rape of subornation, or seduction; which is, when a person seduces or entices a maid to uncleanness, or even marriage, and that by gentle means; provided there be a considerable disparity in age or condition between the parties. In this case, the father and mother intend their action reciprocally for the crimen raptus, or subornatio.

The French laws make no difference between the rape of violence and that of solicitation, or subornation; they make both capital. This kind of rape our laws call Rapeishment; which fee.

Rape of the Forest, is a trepaps committed in the forest by violence.

This is mentioned in the laws of Henry I. as one of the crimes cognizable alone by the king.

Rape is also a name given to the wood or stalks of the chaffers of grapes, when dried, and freed from the fruit.

The rape is used in making vinegar, serving to heat and four the wine: but it is first put into a place to four itself, before it be call into the vinegar vessel; to which end, presently after the vintage, it is carefully put up in barrels, like wine or beer, or else it will heat itself and be spoiled. There is no other way of keeping rape hitherto discovered, but to fill the vessel, in which it is contained, with wine or vinegar.

Rape, Rape, is also used for a part or division of a county: signifying as much as a hundred.

Though sometimes rape is taken for a division containing several hundreds. Thus Suffolk is divided into fix rapes, viz. those of Chichester, Arundel, Bramber, Lewes, Pevensey, and Hastings: every one of which, besides its hundreds, has a castle, a river, and forest belonging to it.

The like parts in other counties are called tithings, lathes, or wauperakes.

Rape, in Botany. See Nupes.

Rape, Broom. (See Orobanche.) It frequently grows to
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to the roots of genista or broom, whence it is called *rapum gentile*, or broom rape; it is also found among corn. The herb preferred, or its syrup, is said to be of excellent use in splenetic or hypochondriac disorders, and an ointment prepared of it with tallow's fat, is good for hard and febrile tumours.

Rape, *Wild*. See MUSTARD.

Rape, in Gardening, the common name of a plant of the cabbage kind. The variety called the French turnip, or *Brassica napus*, has been long cultivated upon the continent, and preferred to the common turnip as a culinary vegetable. And it has been lately noticed in the "Transactions of the Horticultural Society," that it has been brought to the principal London markets for more than twelve years past by one person only, and sold chiefly to foreigners, though, when once fully known, it will be found a very useful and acceptable root in most families, as being more delicate in its flavour than the common turnip. It is used in much the same manner. It enriches soups, and there is not any necessity for cutting away the outer skin or rind, but only to scrape it, as it is a great deal thinner than that of the turnip. When stewed with gravy it forms an excellent dish, and being white and shaped like the carrot, when laid alternately with those on a dish, they become very ornamental. The French dress them somewhat in this manner.

The roots are to be washed quite clean by means of a brush; then scraped, cutting a thin slice away from the top and bottom parts, so as to make them all of equal lengths: after which boil them in water, with a little salt, until they are tender; then put them into a few pipes, with a gill of veal gravy, two or three spoonsful of lemon pickle, one of mushroom ketchup, a little mace, and salt, letting them simmer, but by no means boil, for a quarter of an hour; afterwards thicken the gravy with flour and butter, serving the whole up quite hot. Some add a few spoonfuls of cream mixed with yolk of egg to this, just before dishing up; and others dress them in a similar manner to the above, laced rather thinly, with Madeira, or other wines, after they have been fried to a brownish colour. See *Brassica*.

Rape, in Agriculture, the name of a plant much cultivated for its seed, and also as a green food for cattle and sheep. The methods of culture and management that are necessary in raising crops of this sort, have been already described and explained. (See Cole.) It may, however, be here necessary to detail a few of the experiments that were made under the direction of the Dublin Society, by Mr. W. Whyn Baker, about the years 1769 and 1770, as they tend to throw additional light on the nature of the plant, as well as its cultivation, though the soil was not the most suitable for it. It was a shallow soil, of a strong adhesive nature when wet, and when perfectly dry, in lumps, almost impregnable; but between wet and dry, reducible. It lies upon a bed of lime-floury loamy, and has a natural declivity to the north-west; naturally very poor, and, he believes, never received any manure until he cleared it. Three acres of this land were, in 1768, under potatoes, in the ordinary method of the country, in seven-feet beds, and four-feet trenches. In 1769 they were under drilled turnips.

The frost, snow, hail, and rain which they had this year in the months of March and April, rendered it impossible to get the ground in any tolerable condition for the rape-feed before the 18th day of April. On that day twenty broad feet were sown, with twelve ounces of rape-feed to each foot or ridge. He intended to have sown it earlier, but the event will shew, that, as it was, he sowed it too early, at least upon this ground.

It was low in coming up, and made but a poor figure until July. After which it shot forward; but instead of affording a plentiful mowing crop for the purpose of foddering cattle, it soon began to run up very fast, broke out into branches, with few and small leaves, like rape in blossom from the autumn sowing, but with strong branches and few leaves; and, in a short time after, began to grow hard, pipcy, and the feed to form.

It September he began to sow it for cattle, and they ate it with great eagerness; but every day it became worse, by growing harder; infomuch, that before it was exhausted there was great wafle, as to the object of fodder, but it wonderfully raised the dung-hill, which, in his mind, is of the first moment to the farmer: for if he has manure in plenty, and disposes of it judiciously, there is hardly any thing he need to fear, except climate.

It was very far in October before all its rape was cut, (and the feed coming forward very fast,) although it was brought home in great perfection. It was so strong, that the mowing of it could not be accomplished with a common scythe; it would have broken an hundred; but he had by him a short strong scythe, with a thick back, intended to mow bushes and other rubbish; with this instrument he got it moved, but not so close to the ground as he wished, it being next to impossible to mow such strong plants as these were close to the ground; and he became the less solicitous about it, as from the strength of the rape shoots and roots, and the weeds which were upon the ground, owing to the rape shooting up in tall stems, he gave up his intention of fowing the ground with wheat, as was originally intended. Hence he concludes, that the rape was sown much too early.

On the 16th of July he transplanted some of this rape in rows upon ridge four feet wide; these plants flourished much better than the former, and were at least four times the size of any of those left in the ground where they were sown. Nevertheless, these also ran to seed; but the cold nights coming on prevented their forming their seed like the former. They were vastly more tasty, and much better food for cattle.

On the 24th of July, he drilled rape-feed upon the same ground.

\[1 \text{. Six ridges four feet wide, and thirty-two perches long in single rows.}\]

\[2 \text{. Six ridges the same length and breadth, in double rows, ten inches asunder.}\]

It is observed, that the double and single rows were drilled alternately on the same ground, on the 18th day of July.

\[3 \text{. Six ridges four feet wide, and thirty-two perches long, drilled in single rows.}\]

\[4 \text{. Six ridges the same length and breadth, in double rows, ten inches asunder.}\]

He remarks, that these were sown in alternate rows, on the same ground, on the 24th of July. And that the several rows were thinned the latter end of August, and twice horse-hoed during the summer. On the third of April 1771, he had a row of each of these cut and weighed, and the produce was as follows:

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3 1 2
RAP

On the whole, it is flatted, that the first fowing in July afforded considerably greater produce than the first, for the plainest reason, that the earlier we sow this feed, the sooner it runs; and consequently affords the least produce for the purpose of foddering cattle in the yards for making dung, and seems to account very strongly for the state of the first experiment.

And the double rows produced uniformly more than the single rows; and indicate that the double are to be preferred in drilling rape for foddering cattle.

The following trials are on fowing rape-feed broad-call. On the 24th of July two acres were fown broad-call, with ten pounds of seed to each acre, in the same field where the other experiments were carried on; but the soil not so fluff by a good deal, has abundantly fewer loofe stones in it, is very shallow, and poor, to an incapability of producing any thing to profit, without great allowance of manure.

In July he manured it with the dung of his yard, confiding of that of horned cattle, horels, and fwine. The dreefling was indeed very high; about two smart one-horse cart-loads to a perch. He having ever found that one acre, highly improved, is much more valuable than five imperfectly handled, was the reason why he gave this poor piece to liberal a dreefling.

The rape came up but slowly for a time, as he finds to be the nature of the plant, but at length it shot forward, and flourished away: but in winter it met with a fate which he was not aware of, nor did he expect. The wood-pigeons lay upon it prodigiously, and did it great damage. Some plants he observed in the froft to appear as if they had been fitched: whether that was owing to the wounds given by the birds, and thereby giving the froft the greater force, or whether it was owing entirely to the severity of the froft, is not in his power to determine. However, very early in the spring this rape fhot forward, and as the days lengthened the visits of the pigeons were less frequent, until they totally left it.

From this rape breaking out into blofflom sooner than he expected, he is inclined to believe that the 24th of July is too early to fow it for the purpose of foddering cattle in the yard.

However, early in April he began to sow this rape for the horned cattle, fuch as cows, plough bullocks, young cattle, calves, and fwine. They all ate it with the greatest eagerness, and were foddered with it every evening, until the 19th of May inclusive, and wheat fraw in a morning, fave four calves of the preceding year; and they were foddered twice a day with rape, and had fraw before them alfo, and throve upon it vaftly better than the other cattle; for no other reason, he believes, than because they were allowed more than the others: in short, they were in fuch order, that he dares believe the butchers would have been glad to have had them for killing.

Exp. I. April fowing. Ran, not answering the purpose.
II. Ditto transplanted. Ran, but not fo foon as the other.

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<th>Date</th>
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<tr>
<td>July 18</td>
<td>Single rows produced per acre</td>
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<td>Double rows ditto</td>
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<td>Broad-call ditto</td>
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<tr>
<td>July 24</td>
<td>Single rows ditto</td>
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<tr>
<td></td>
<td>Double</td>
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<td></td>
<td>Broad-call ditto</td>
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Rape is a great deal cultivated in fome diftricts in the county of Essex for the feed. The fystem is very profitable, but this fort of crop is found to draw or exhaust the land a good deal. It is thought by fome to prepare well for wheat, especially when fed off upon the land. In fome places they, however, consider it more beneficial to till, after this crop has been feeded for fpring corn, than to put in wheat, which, however, is ftil the molt common practice. Clover would certainly be better than either method.

He observes, that he need not tell the farmer how necessary it is to be frugal of provender in an hardy dry fpring, as the weather was, when he was like to be hard run with forty head of cattle, many of which he fhoold actually have been obliged to fell at fo improper a feonon, had he not been possedled of these two acres of rape. He adds, that there is yet another circumstance which renders this a truly valuable fodder. The milk of the cows increafed prodigiously; and the milk and butter were as good, fweet, and well-flavoured, he thinks, in every particular, as ever he tafted in June. Even the cream for the tea appeared to be perfectly free from any foreign flavour. The cows got hay every day, in the fame manner as he has in former years mentioned them to have, when feeding upon cabbages.

The simplicity of the culture for rape, for the purpose of feeding cattle, he cannot but think a particular recommendation to the farmer, and the cheapnefs of the feed in purchafe, or the cafe with which he may raife it, are objects which cannot fail, he thinks, of being perufual to him. And all perfonft, who have annexed to their farms any boft, or other waft ground, the improvement of which can be executed by burning, might freely raife fuch quantities of rape for the purpose of moving pafture, as would enable them to keep almoft any number of cattle; by which they would not only be bringing in the waft land, but making that the foundation of improvement to their found land, by the immeasurable quantities of dung they might raife by this means from the waft land. Here the advantage to the cultivator would be double.

On the firt day of May he had four perches of this rape measured out for weighing. It was mowed, immediately drawn home, and weighed. The four perches afforded seven hundred and two quarters: multiplying this by forty, fows the acreable produce to be fifteen tons. The quantity indeed but small. However, the feonon in which it is to be had renders it more than ordinarily valuable, and, he thinks, bids fair to make it an object of husbandry, as a paflure for cattle.

This year, 1770, Mr. Baker ploughed up fix acres of wheat fubble, as soon as the wheat came off, harrowed it down the 12th, 13th, 14th, and 15th of September, then fowed rape-feed over the whole field, and gave it a light buft harrowing. The rape came up very thin, and made fo poor an appearance in the fpring, that he ploughed up the field, and fowed fpring corn. This is a strong indication that but little is to be expeted from fowing rape upon wheat fubble; because after the wheat comes off it seems to be too late in the year to fow rape. But fomething may be chargd, as he observes, to the natural moistuie of the foil. See Cole.

The following is the recapitulation of his experiments on rape, as paflure for cattle.
consequence, clover, and is consequently prejudicial to the next succeeding winter crop. Other districts think very differently on this point. In feeding the crop, the produce is here considered to be general from twenty-nine to thirty-four bushels of grain. In the greatest crops and best seasons, in particular parts it is supposed to rise even to one as five and six quarters the acre.

In Berkshire, the fruit of the crop is not so much cultivated as it should be, as it will succeed well on soil where turnips will not, and with equally beneficial effects to the future crops, when sown on the ground. When employed it is usually sown and managed so as to come into a high state of perfection in the early spring months, when meal is most readily supplied from the deficiency, and found remarkably useful, one acre of it affording more feed than two of turnips.

This fruit of the crop is still less grown in Oxfordshire, though occasionally had recourse to, especially on the rich land about Banbury. Some few it in mixture with the tankard turnip feed, for the purpose of weaning lambs upon: they begin with the rape, and it teaches them to eat the turnips; it is found to be a very good food for this fruit of fowl.

In the county of Suffolk, the South Down sheep farmers hold it in great estimation, sowing it either alone or in mixture with tares as a food for their livestock; very rarely for the purpose of feeding. The ewes and lambs are wattled upon it the year round, and it is very generally allowed to be most efficacious, and highly nutritious to the young lambs. Some, at the lambing season, hardly allow their ewes any other food but this, as the rape is found to produce a larger supply of milk than turnips; which, it is supposed, has the effect of extending the udder, without affording any considerable flow of milk. This crop is conjectured, however, in some cases, to have the effect of causing the slipping of the lambs, where the ewes are fed upon it. But such an effect is very improbable to arise in this way; other ailments may have been overlooked.

In some cases on Down land, ray-grasses is sown with the rape for sheep feed, one gallon of rape-feed and two of ray-grasses to the acre. The rape is first fed off; and after, the ray-grasses takes and affords a basic food for the spring season. The rape crop is usually put in about June, or the following month, one gallon to the acre. When folded off, a rood and a half is a sufficient daily consumption for a flock of six hundred sheep, or rather more.

As it has been found in the improving of peat boggy marshy lands, that what is principally wanted is a crop which can be sown and reaped in the summer months; and which may require neither labour nor attendance during the moist seasons of autumn, winter, and spring; the writer of the "Treatise on Landed Property" has suggested that fortunately, such a crop is natural to, and has long been in use to the climate of this island, as well as one of the most profitable in the agriculture of it; and that this is rape; which is not only sown, but reaped, in the very height of summer; and which is known to delight in a soil of this nature. It has, however, not only lately been found capable of being raised with advantage on more productive soil, as a first crop after draining, from some recent trials made in the north, after the above operations, levelling, paring, and burning, and turning the ashes in. The result of which was, though the crop was too late in being put in, and the land laid in an improper manner, such as to prove clearly that rape-feed may be raised with profit as a first crop on drained moor soils. And it is thought highly probable that many extensive tracts of land, which now lie entirely waste, and as nuisances in their neighbourhoods, may through this means be improved with immense profit to their proprietors. The experiment may be tried at a small expense. The cost of the labour and seed required for a sufficient trial are inconsiderable. The proof, it is supposed, is not whether rape will thrive as hedges, but whether it will mature its seed, on the given soil, in the given situation.

After being recompensed for the previous expenses, in one or more rape crops, as there is here no danger of the exhaustion of the soil,—of impoverishing, perhaps, ten feet depth of vegetable mould, it remains to lay the foundation of more permanent profits, which is to be done by sowing of grass; feeds either with or over the rape crop, or by light, cautious sowing after removing the flax, as may be necessary, until there is a firmness of surface and a fitness for mixed cultivation, which may be much hastened by the use of heavy calcareous and earthy substances at any time during the process of improvement.

Rape Cake, the refuse or cake remaining after the oil has been expressed from rape-feed. It is said to be useful as a manure. See MANURE.

This substance is found by chemical trials to contain a large quantity of mucilage, some albuminous matter, and a small quantity of oil. It should be kept as dry as possible before it is applied to the soil, and be employed in that way while it in a fresh state. It is successfully applied in several ways and intentions, and affords an excellent dressing for turnips. See the next article.

Rape Dust, the small reduced parts of the dried refuse of rapefeed, or the rape cake, after the oil has been obtained from it. This substance has been found useful as a topdressing for crops of different kinds.

The rape cake, when reduced into powder or dust by means of a machine, has been extensively used in Norfolk; and when for turnip crops, it has been the custom to sow it some weeks before the seed of that root is put into the ground. In the practice of Mr. Coke of that district, it has, however, been found, that by having it brought into a fine powder it may be drilled from the fame machine, at the same time with the turnip seed; and that, by thus delivering the manure and the seed from the same pipes and shares of the drill machine, a ton of dust does six acres in the place of three. See TURNIP.

In Lancashire some farmers use it with great advantage as a manure for potatoes, putting it in with the fets in the proportion of about thirty-two bushels to the statute acre; but if the ground were well prepared, and the dust carefully deposited for the reception of the fets, it is supposed, a much smaller quantity would be sufficient. It produces much luxuriance in the crops, and a very fine produce.

Rape Oil, the oil obtained by means of expression from the seeds of this plant, in mills constructed for the purpose. The refuse oily substance of this kind may be employed as manure in mixture with rich earthy matters, with great advantage, wherever it can be procured in any quantity at a reasonable price.

Rape, in Geography, a river of Chili, which runs into the Pacific ocean, S. lat. 34° 8'.—Allo, a town of Chili, on the aforementioned river; 70 miles S. of Valparayo.

Raperlah, a town of Hindoostan, in the Carnatic; 13 miles N.E. of Ongole.

Rapha, in Anatomy. See Raphe.

Raphael, one of the seven archangels, who are said to be continually before the throne of God, and ready to perform his commands. We have no such name in the Old

or
RAPHAEL.

or New Testament; but his history occurs in the book of Tobit, c. xii. If the story of Tobit be true, it is not improbable that the angels, both good and bad, whose names do not appear to have been known before the Babylonish captivity, are figurative personages; and Raphael might only denote the salutary protecting agency of divine providence, so dispersing events as to produce a happy issue.

Raphael Sanzio, da Urbino, in Biography, during whole life, and by the exertion of his talents, in conjunction with those of Leonardo da Vinci, Titian, Michael Angelo, and some few others, the art of painting reached its acme in modern times, was born in the city of Urbino, on the morning of Good Friday, in the year 1483. He was descended from a respectable family, and many of his ancestors had been painters; as was his father Giovanni Sanzio, whose talents, however, did not elevate him to the first rank. He cultivated with care the inclination which his son Raphael exhibited, at an early age, for painting; and was soon repaid by the assistance he acquired from him, in several of the pictures he was employed to paint in his native city of Urbino. But finding that the taste of Raphael merited more skillful guidance than he was able to give it, he placed him under the tuition of Corradini, better known by the name of Carnevale, for a short time, till he could be received as a pupil by Pietro Perugino, at Perugia.

This matter was then in very high esteem, though his style was dry and meagre, in comparison with that of Masaccio, and others of the Florentine school. It is not surprising that Raphael, endowed as he was by nature, and trained as he had been in art, should soon become the rival, rather than the pupil, of such an artist. Accordingly we find, that his aptitude for the practice of art enabled him quickly to acquire his master's manner, and that in so perfect a degree, that connoisseurs were puzzled in their judgments upon the works which proceeded from Perugino's studio; and ordinary observers completely deceived. Vafari speaks of an Assumption of the Virgin, crowned by her Son, and the twelve apostles below, round her tomb, contemplating the celestial glories; with three small pictures in the same frame below it, of the Annunciation, the Adoration of the Magi, and Simon embracing the Saviour, painted at this period by Raphael, as being wrought with extreme beauty, and precisely like the work of Perugino.

We have to lament that we are left ignorant of the time when Raphael went as a pupil to Pietro, how long he remained with him, or when he left him, or rather was left by him; as that matter returned to Florence, to finish some pictures he had begun there some time before. He must certainly have been very young, from the number of pictures which he subsequently executed, previous to his going to Rome in his 25th year, and probably not more than 16 or 17, when he acquired his liberty by the departure of Perugino.

From Perugia he went to Citta di Castello, where he painted a St. Nicola crowned by the Virgin and St. Augustin, for the church of St. Augustine; and for that of St. Dominico, a picture of the Crucifixion of Christ, accompanied by angels, the Virgin, St. John, &c.; which would certainly have been considered as Perugino's, if Raphael had not left his name to them. But he was considered to have much surpassed him in another work, representing the marriage of the Virgin and St. Francisco, for the church of St. Francisco, in the same city. He acquired by these productions a great and deserved extent of fame, and thus early entered with success that course, which conducted him to the highest pinnacle of renown as an artist.

Attached to his person by friendship, and attracted by his skill as a designer, Pinturicchio, then employed by pope Pius II. to adorn the library of the Duomo at Sienna, sought the assistance of Raphael, and engaged him to compose designs for his work. This he undertook, but proceeded only to the preparation of some of the cartoons, when his ambition and his curiosity were stimulated, and his work interrupted, by the renown spread through the country of the cartoons painted by those great rivals, Leonardo da Vinci and M. Angelo, for the council-hall at Florence. He immediately determined, in conjunction with almost all his brother artists of the day, upon going to see and form his judgment upon them for himself; and consequently left his engagement with Pinturicchio, and proceeded to Florence.

In this city he found many attractive beauties, both of nature and art, that he resolved to fix his residence there for some time. His agreeable person and manners, combined with the extraordinary talents he had manifested, infured him friends; and he became intimate with several artists of celebrity, among whom were Ghirlandaio, St. Gallo, and Taddeo Taddi; the latter of them, a learned man, and friend of cardinal Bembo, took the youthful painter to his house and table, and thus afforded him the best introduction to the world, while he pursued his more immediate studies. This kindled the gentle heart of Raphael accepted with grateful emotion; and as he painted several pictures during his residence in that city, he presented two of them to Taddi. One of these pictures, a Madonna with the Child, and St. John bringing a little bird to him, the heirs of Tadi fold to the archduke Ferdinand Charles of Austria at a great price: the other is lost sight of. He also presented a picture to his friend Lorenzo Nati, which afterwards found a place in the Medicean gallery, and a duplicate in that of the monastery of Valombrosa.

From Florence Raphael was recalled to Urbino, by the death of both his father and mother; and there, when he had arranged his private affairs, he was engaged by Gindobaldo de Montefeltro, and several others, to paint religious subjects for the altars of their chapels; and among these he painted at this time, there were the two little St. Georges, now in the gallery of the Louvre. These commisions he executed with great taste and delicacy; and Vafari, who enumerates them, more particularly speaks of one of Christ praying in the garden, painted for Francesco Maria, duke of Urbino, as being finished with all the neatness of a miniature. What is become of most of these pictures, it is not easy to ascertain; but it is a curious fact, that not one of them remains at this time to adorn the native city of this great artist.

Thence he returned to Perugia, and painted several pictures. For the church of the Frati del Servi, one of the Virgin, with St. John Baptist, and St. Nicholas. For that of St. Stevens, in the chapel of our Lady, he painted in fresco a picture of Christ in glory, with God the Father, surrounded by angels and six saints, three on each side. Upon this picture he wrote his name in large letters of gold, and very condescendingly, as if he himself was pleased with the performance of it. He also painted here a picture for the nuns of St. Antonio da Padua, of our Lady with the Infant upon her lap clothed, and near her St. Peter, St. Paul, St. Cecilia, and St. Catherine. The airs and attitude of the two female heads were regarded as the most tasteful work of the time, wrought with the greatest degree of beauty and grace. Above the picture, in a semicircle, was represented
represented the Almighty Father; and at the foot of it, in three compartments, were the scenes of our Lord's sufferings, viz. his agony in the garden, carrying his cross, and dead upon the lap of the Virgin. It is not known what become of the centre picture, or the uppermost compart- ment; the lower ones formed a part of the Orleans collection. The execution of these works was performed in a style much improved upon that of Perugino; with more breadth, more lightness, and more freedom and variety of action; proving that he had not ill spent the time he had devoted at Florence to the study of the works of other painters. Hence we may date the commencement of what is termed his second manner, from his first visit to that city.

Soon after he had produced these works at Perugia, that zeal for cultivation, which always accompanies true genius, led him to determine upon again visiting Florence, at that time the emporium of science and of art. Though the native strength and purity of his mind were such as to conduct him, under favourable circumstances, to his future prominent station; yet he does not appear to have been so extraordinary and original an inventor in the art itself as M. Angelo, or his great predecessor and rival, Lionardo da Vinci. He knew how to take a hint of what was offered to his view, and to cultivate and improve it to his purpose; but it yet remains a problem, whether Raphael, alone, and without the leading aid of those great and original artists, would have ever seen the sublime of painting. His power may rather be said to have confined in ability to employ the materials furnished by their invention, viz. the style of Michael Angelo, in form; and of Lionardo da Vinci, in chiaro-scuro and colour; in beautiful conceptions, illustrative of the character and passions of man; and in an admirable feclution of subject, and mode of conveying it.

He himself appears to have been conscious of this; for we find him in the midst of honourable employment, leaving the prosecution of it, to study and improve himself by a constant observation of the works of other renowned artists, and again repairing to Florence, where alone he could find the true source of sound cultivation, and in which he made so good use of his time, as to fit him in great measure for the glorious field of exertion which awaited him.

On his return to the renowned abode of these great artists, from whose works he sought improvement, he had a letter of recommendation and introduction from the dukes of Urbino to Pietro Soderini Gonfaloniere of the city; and was thus introduced to the best circle of improvement and information.

It would have been highly gratifying to have been enabled to trace the steps of a man so distinguished in the art, from the earliest commencement of his studies; but the neglect of dates, by his historians, counteracts every wish to follow them more closely; and the record of facts leaves us only the means of conjecture. That he began to paint original pictures very soon after he was placed with Perugino is evident, and he must then have been very young, for it is on record, that the pictures by Pinturicchio, for which he made the cartoons at Sienna, were completed in 1503, at which time he was 20. If we allow, as we reasonably may, two years for their execution, it will place his first visit to Florence in 1501, at the age of 18; and it certainly cannot have been far from that period. In every part of his life, modesty, ingenuity, and the ardour of a mind entirely devoted to his art, characterized his conduct. His industry and ingenuity seem to have kept equal pace; and the rapidity and certainty with which he must have painted, to produce so many pictures in so short a space of time as he lived, are not the least extraordinary part of his history.

On this, his second abode at Florence, he studied deeply the works of Mafaccio, and the cartoons of Angelo and Da Vinci; and attached himself in friendship to Baccio della Porta, better known by the name of Fra. Bartolomeo; than whom no one was better qualified to direct him rightly in whatever was grand and dignified, and from whole judicious information in the art of calling draperies and of colouring, Raphael evidently improved exceedingly; while he had the pleasure, in return, of communicating to his friend the principles of perspective. Yet notwithstanding these helps, he did not entirely free himself from the formal and dry manner of his master, though he painted affably both in portrait and history. In the former he produced the portraits of Angelo Doni and his lady Maddalena Strozzi; and in the latter he painted for Dominico Caneggiani, a Madonna, with the Infant playing with St. John brought by Elizabeth, who regards St. Joseph as he stands near, leaning both his hands upon a stick, and inclining his head towards her. This picture appears to have been re-touched, or possibly completed only in 1516, as the name of Raphael, with that date, in letters of gold, is written upon the drapery of the Virgin. He also made a cartoon during his residence in Florence for a picture which he had previously engaged to paint for the Baglioni family at Perugia, and left the city to go and paint it in the church of St. Francesco in that place. The subject of it was our Saviour carried to the sepulchre, accompanied by the Virgin, St. John, &c.; and it was exceedingly admired for the beauty and expression of the figures, and the skill and perfection of the draperies. This picture was removed from Perugia by pope Paul V., and a copy, by Cefare d’Arpino, placed in its stead: it afterwards found a station in the Borghese palace at Rome.

When Raphael had completed this work, he returned to renew his studies at Florence, and was employed by the family of Dei, to paint a picture for their altar in Santo Spirito, which he began, and conducted through the preparatory parts; and in the mean time painted another for the city of Sienna, of the Madonna in an open country, with the Child flanding by her, and St. John kneeling before him, but was interrupted, in its execution, by a summons from pope Julius II. to Rome, and left it in the hands of his friend Gherlandone, to finish a piece of blue drapery which it wanted. This picture was afterwards sold to Francis the First, King of France, and is at present in the French collection, known by the name of the Belle Jardinière. The unfinished sketch of the picture begun for the Dei family, was bought, after the death of Raphael, from his heirs, by Baldassare Turini, and placed by him, in its original state, at the altar of his country church; it afterwards came into possession of the house of Buonvicini di Pefcia, and was sold, by that family, to the grand duke Ferdinand, who, on removing it, placed a copy by Carlo Sacconi in its stead. This was done at night, and with the utmost secrecy, for fear of a disturbance among the populace, by whom it was highly prized.

Raphael was indebted for the high patronage of the pope, which placed him in the proper sphere for the exercise of talents such as he possessed, to the friendship of his relation Bramante d’Urbino the architect; and never was recommendation better supported by ability. Upon his arrival in Rome, in 1508, he was received with great courtesy by Julius, and the Camera della Segnatura, in the Vatican, alligned to him. He immediately began the preparation for his first picture, which was the School of Theology, better known by the name of the Dispute of the Sacrament, and in observing which, it is worthy
worth of remark how his mind enlarged, in regard to style in the art, as he became accustomed to consider largely of his work; and according to the field of employment which he found before him. The difference in style between one part of the picture, and that of the other, evidently points out where he began it; viz. on the right of the upper part, where the remains of the school of Perugino appears, and is spread through the centre, where the glory which surrounds our Saviour is represented in the Gothic manner, by rays of gold. As he proceeded, his style enlarged, and the lower part of the picture exhibits an immense improvement, and is almost equal to any of his subsequent productions.

In the same room are the paintings of the School of Athens, the Parthenion, painted in 1512, (where, surrounding Apollo and the Muses, he has introduced portraits of the great poets, both of antiquity and of his own time,) and the Jupiferus, comprising two subjects, one of the emperors Jovianus delivering the digest of his code of laws to Tribonius, and another of pope Gregory IV., giving the decretal to a member of the conclave. Over each of these subjects, respectively, are painted circular ones of single figures, representing Theology, Philosophy, Poetry, and Justice.

When pope Julius saw the superior taste and talent with which Raphael produced the former of these works, he immediately ordered the whole of the Stanze, or chambers, which it was intended to decorate, to be entwined to him; and all that had previously been done by Perugino, Pietro del Borgo, Il Sodoma, and Bramante di Milano, to be removed. But of this order Raphael made only a partial use; preferring entire the work of his first manner, and, partially, the ornamental labours of Il Sodoma.

While he was engaged upon these great works, he was not altogether indifferent to the more agreeable exercise of the pencil, and he painted for the church of the Augustines, the pictures of the prophet Isaiah, and the Sibyls who are supposed to have predicted the coming of Christ. He also painted the portrait of his great patron, Julius, now in the Louvre, and several smaller cabinet pictures of Madonnas, and other religious subjects. By these labours he acquired the renown they so well merited, and his manners appear to have been in perfect accordance with the beauties of his mind. His person also was handsome, and he was beloved, esteemed, and admired. Yet he continued to study, and to improve his talents, employing persons to collect specimens and make drawings from Grecian remains. Full of taste and feeling, he spared no pains to perfect his powers by a thorough knowledge of all that had been done in art, both ancient and modern. In consequence, however, the fact, related by Vafari, may be doubted, of his being admitted, while Michael Angelo was absent, to see the work of that great artist in the church of Sixtus IV.; the taste in which he wrought became aggrandized, and similar to that introduced by M. Angelo. About this time he painted the Galatea for Agostino Ghigi, and the Madonna di Foligno, at the desire of Sigismondo Conti, secretary of pope Julius II., for the great altar of the church at Araceli, and which is now at the Louvre.

In another chamber of the Vatican he painted four other large pictures, the subjects of which are, the miracle of Bolsena, when the officiating priest, who doubted of the real presence in the Eucharist, is offering up the host, and perceiving, with astonishment, that it drips drops of blood; the release of St. Peter from prison; the Hebdorod; and Attila arrested, in his journey to Rome, by a vignon of St. Peter and St. Paul; these were completed in 1512, 13, and 14.

In these pictures his great improvement in colouring and style is most evident, and he continued to carry it still further into practice in another room, for which also he had composed four other subjects, known as the Incendio del Borgo; the coronation of Charlemagne by Leo III.; the fame pope defending his conduct to the, same emperor; and the descent of the Saracens at the port of Olbia.

Whilst Raphael was engaged on the Heliodorus, his first great patron, Julius II., died; but fortunately for the arts, if not for the tiara, he was succeeded by another, Leo X., who was even more attached to them, and more fond of the renown arising from the cultivation of whatever adorns society. By him, therefore, Raphael was ardently encouraged to proceed with his labours, and he continued to make designs for other apartments, particularly for the great hall of Constantinople, as it is now called; but he did not live to execute them. The Incendio del Borgo was the last upon which he himself wrought; the rest were completed by Giulio Romano. He was also employed by Leo to make the cartoons now at Hampton Court, as exemplars for works in tapestry, to be executed in Flanders, and which were completed at the expense of 70,000 crowns. Fortunately for us the originals were never returned to Rome, and were purchased afterwards by Charles I.

Upon the death of Bramante, in 1514, the superintendence of the architectural concerns of the Vatican was entrusted to Raphael, who had already exhibited his knowledge and taste in that art, by the introduction he had made of it in his pictures. He invented and began a palace for himself, and made several designs for others.

Notwithstanding the immense application necessary for the invention and completion of these important labours, together with the designs he composed for the ornamental parts, and the scriptural subjects on the ceilings and the coining of the loggia and Stanze of the Vatican, he found time to execute in freSCO the designs which adorn the palace of Agostino Ghigi; the capital portrait of his great friend Leo X., with the cardinals de Medici and Roffi, now in the Louvre; the St. Michael, and the vignon of Ezekiel, both in the same grand depot; a Madonna, Child, and St. Anne, for Florence; and a large picture of Christ bearing his Cross, for the monastery of St. Maria della Spalata, at Palermo. Of this picture it is reported, that being sent on shipboard to go to Sicily, the vellum was beaten from its course by a tempest, and the mantuns left; when it drifted to Genoa, and of course its preservation was attributed to the divine influence of this great work. The Genoeese chafe also to suppose that the band of God had thus pointed out their city as the proper place for its residence; and would not relinquish it for a length of time, till the papal influence interfered, when it was configured to its original destination. He also painted the picture of St. John, which adorned the Orleans collection; and last of all, the Transfiguration; which indeed he had not quite finished when the unrelenting hand of death fet a period to his labours, and deprivd the world of further benefit from his talents, when he had only attained an age at which most other men are but beginning to be useful.

The immediate cause of his death is allowed to have been brought on by too great an indulgence in gallantry, and, Vafari adds, by mismanagement of his physicians, who bled him when they ought to have administered reforatives. On his death bed he made his will, leaving his favourite pupils, Giulio Romano and II. Fattoro, his heirs, and ordering his burial
burial to take place in the Pantheon (the church of Santa Maria Rotunda), where a monument still remains to his honour. He died on the same day of the year on which he was born, Good Friday, in 1520, at the age of 37, deeply lamented by all who knew his value. His body lay for a while in state, in one of the rooms wherein he had displayed the powers of his mind, and he was honoured by a public funeral; his last produce, the Transfiguration, being carried before him in the procession; and, that Raphael might not be deprived of so noble a memorial of this extraordinary man, it was placed by the cardinal de Medici in the church of St. Pietro a Montorio, instead of being sent to France, as was originally intended.

Mr. Fufeli, in his edition of Pilkington, has given so discriminating and just an idea of the peculiar excellencies of Raphael, that we shall conclude our history of him by quoting it. "The general opinion has placed Raphael at the head of his art, not because he possessed a decided superiority over every other painter in every branch, but because no other artist ever arrived at uniting with his own peculiar excellence all the other parts of the art in an equal degree with him.

"The drama, or in other words the representation of character in conflict with passion, was his sphere; to represent this, his invention in the choice of the moment, his composition in the arrangement of his actors, and his expression in the delineation of their emotions, were, and are, and perhaps will be unrivalled. And to this he added a style of design dictated by the subject itself, a colour suited to the subject, all the grace which propriety permitted, or sentiment suggested, and as much chiaroscuro as was compatible with his supreme defect of perplicity and evidence. It is therefore only when he forsook the drama, to make excursions into the pure epic or fabliche, that his forms become inadequate, and were inferior to those of M. Angelo; it is only in subjects where colour from a vehicle becomes the ruling principle, that he is excelled by Titian; he yields to Correggio only in that grace and that chiaroscuro which is less the minifter of propriety and sentiment, than its charming abuse, or voluptuous excess; and which fascinates to the eye what was claimed in vain by the mind.

"Michael Angelo appears to have had no infancy: if he had, we are not acquainted with it: his earliest works equal in principle and elements of style the vigorous offsprings of his virility: Raphael we fee in his cradle, we hear him hammer: but propriety rocked the cradle, and character formed his lips. Even the trammels of Pietro Perugino, dry and servile in his style of design, formal and gothic in his composition, he traced what was essential, and separated it from what was accidental, in figure and subject. The works of Lionardo, and the cartoon of Pifia, invigorated his eye, but it was the antique that completed the fyllem which he had begun to establish on nature. From the antique he learned disjermination and propriety of form. He found that in the construction of the body, the articulation of the bones was the true cause of ease and grace in the action of the limbs, and that the knowledge of the was the true cause of the superiority of the antients. He discovered that certain features were fitted for certain expressions, and peculiar to certain characters; that such a head, such hands, and such feet, are the flamen or the growth of such a body, and on phyfognomy established uniformity of parts. When he designed, his attention was immediately directed to the primary intention and motive of his figure, next to its general measure, then to the bones and their articulation, from them to the principal muscles or thofe eminently wanted, to their attendant nerves, and at last to the more or less essential

minutiae; but the character part of the subject is infallibly the characteristic part of his design, whether it be a rapid sketch, or a more finished drawing. The strokes of his pen or pencil themselves are characteristic: they follow the direction and texture of the part; flesh in their rounding, tendons in straight, bones in angular lines.

"Such was the felicity and propriety of Raphael, when employed in the dramatic evolutions of character! both suffered when he attempted to abstract the forms of sublimity and beauty; the painter of humanity, not often wielded with success super-human weapons. His gods never rose above prophetic or patriarchal forms; if the singer of Michael Angelo impressed the divine countenance oftener with threnodie than awe, the gods of Raphael are sometimes too affable or mild, like him who speaks to Jacob, in a ceiling of the Vatican; or too violent, like him who separates light from darkness, in the loggia of the same place. But though, to speak with things, he was chiefly made to walk with dignity on earth, he soared above it in the conception of Christ on Tabor, and still more in the frown of the angelic countenance that withers the strength of Heliodorus.

"Of ideal female beauty, though he himself, in his letter to count Calighion, tells us, that from its scarcity in life, he made attempts to reach it by an idea formed in his own mind, he certainly wanted that standard which guided him in character: his godesses and mythologic females are no more than aggravations of the generic forms of Michael Angelo. When the drama inspired Raphael, his women became definitions of grace and pathos at once. Such is the exquisite line and turn of the half-averted kneeling female with two children, among the speculators of the punishment inflicted on Heliodorus; her attitude, the turn of her neck, supplies all face, and intimates more than he ever expressed by features."

RAPHAEL, in Geography, a fertile and healthy district, being the well-nigh moist in the Spanish part of St. Domingo. Its northern boundary is found in part of the French parish Gonfalves. The air round St. Raphael is very fabulous, but the town, which is in a hollow, is very hot; to leagues S. of Cape François.

RAPHAEL, St., Cape, lies at the S. end of St. Domingo, and is the S.E. limit of Samana bay.

RAPHANEA, in Ancient Geography, a city of Syria, between which and Acre, or Aract, a city of Judea belonging to the kingdom of Agrippa, the Sabbatical river flowed. Joseph. de Bell. i. vii. e. 24. Raphanea is, perhaps, the Arpal of scripture. 2 Kings, xviii. 34. xix. 15. 11. x. 9. xxxvi. 19. xxxvii. 13. Jerem. xlix. 23.

RAPHANIA, in Medicina, an appellation given by Linnaeus, and afterwards by Dr. Cullen and others, to a severe and fatal disease, which has been described as epidemic in Sweden at particular season, and imputed to the use of the raphanus raphanifrum of Linnaeus as food.

It is not necessary to describe the symptoms of this disease in this place: since it is, in fact, the fame malady which has been epidemic in various other countries of Europe, during seasons of scarcity; and has been attributed to various other species of unwholesome grain, but more especially to diseased rice, affected with the ergot, to the lolium temulentum, to charlock, &c. We have already entered at great length into the history of the symptoms and imputed causes of this formidable malady, which has been more commonly denominated ergot, from one of its supposed sources. (See Ergot.) We have endeavoured also to shew, that it constituted one of the varieties of epidemic disease, described by the ancients, under the appellation of Ignis Sacer (which see); and that, instead of being properly imputed to the

3 K admixture
admixture of any of these substances with the corn used for food, the disease is to be ascribed with more probability to the insufficient nourishment afforded by damaged corn, or the actual death of it, which usually occur together; especially as these diseases have commonly been epidemic in years of scarcity, which is the only circumstance that can be observed in common to all the epidemics described by authors. In addition to the works on ergot and ignis facer, formerly referred to, consult, for an account of raphania, Pulletney's View of the Writings of Linnaeus; Rotham's Paper, in the Amœnités Academ. of Sweden; Tiffot, Epitôle Med. Pract.

RAPHANIS, in Botany, the name by which the Attics, among the Greeks, called the radish; for the word raphanas, or raphanus, with them, does not express the radish, but the cabbage. The Greek of all other places occurred in calling the radish raphanas, and the cabbage raphanae, and it is owing to this that we have many authors who confound together these two plants, though so very unlike one another in appearance and use. It is generally to be understood, that wherever Theophrastus mentions the word raphanas, he means by it the cabbage; and the same being observed, in regard to all the other Attic writers, the whole danger of confusion and error will cease.

RAPHANISTRUM, a name given by botanists to the wild radish, and designed to express its affinity to the cultivated one. See Raphanus.


Gen. Ch. Cal. Perianth inferior, erect, of four oblong, parallel, converging, deciduous leaves, gibbous at the base. Cor. crucifera, of four inerferly heart-shaped, spreading petals, whose claws are rather longer than the calyx. Nectariferous glands four; one at each side, between the outer lamen and the pili; and one at each of the opposite sides between the longer lamen and the calyx. Stem. Filaments six, awl-shaped, erect; two opposite ones the length of the calyx; the rest as long as the claws of the corolla; anthers simple. Pfl. Germen oblong, tumid, tapering, the length of the stamens; style scarcely any; stigma capitate, undivided. Peric. Pod oblong, pointed, swelling here and there, imperfectly jointed, without valves. Seeds roundish, smooth.

Oft. Raphanus of Tournefort and Gartn. has a fpoagy fruit, of two cells, not burbling. Raphanistrum of the same authors has a jointed fruit, separating at the joints.


1. R. sativus. Common Garden Radish. Linn. Sp. Pl. 935. Willd. n. 1. Ait. n. 1. Ger. Em. 257. (R. primus; Matth. Valgr. v. 1. 399.)—Leaves lyrate. Pod roundish, tumid, of two cells.—The native country of this well-known plant, so commonly cultivated in gardens, is not ascertained. Linnaeus mentions China; but his authority does not appear. Its chief value with us consists in it, the root, esteemed for its grateful pungency, mixed with a watery coolness. The shape of this part varies, from its natural pindle-like figure, to a globular one, and the colour of the skin from purple to white. We doubt much whether the R. sativus of Baulin, commonly called the Black Spanish Radish, which Linnaeus marks as, can belong to this species. Its fprines, and black rugger coat, seem to indicate more than a mere variety. We have not examined the herbage. The leaves of R. sativus are lyrate, notched, and rough, especially the lower ones; the upper part of the herb is smoother, and somewhat glaucous. Stem branched. Flowers purple, corymous; soon racemose. Pods erect, tumid, juicy, pale, glaucous, smooth, slightly flattened, various in length and thickness, tipped with an awl-shaped beck. Linnaeus cultivated at Upland a Chinese variety, or possibly species, whose leaves are broader and smoother, and whose habit more lax. The oil of the seeds is said to be used in China.

2. R. caudatus. Long-tailed Radish. Linn. Mant. 95. Linn. fl. Plant. Rac. f. 1. t. 10. Willd. n. 2.—Leaves lyrate. Pod compressed, of one cell, wavy, longer than the whole plant.—Native of Java, where, according to the younger Linnaeus, it is cultivated, and the pickled pods known by the name of Mougri. In Sweden, as well as in England, it may be treated as a hardy annual, like the foregoing; but the present species does not occur in Hort. Kew., though Mr. Lambert met with it last year in a country garden in Wiltshire. The appearance of the plant, weighed down to the ground by its immoderately long serpentine pods, is altogether extraordinary. The lobes and indentations of the leaves are sharper than in the Common Radish, but the flowers and other parts, except the pods, scarcely betray any difference.

3. R. Raphanistrum. Wild Radish, or Jointed Charlock. Linn. Sp. Pl. 935. Willd. n. 3. Ait. n. 2. Fl. Brit. n. 1. 6. Eng. Bot. t. 856. Curt. Lond. f. c. 4. t. 46. Mart. Hort. t. 71. Fl. Dan. t. 678. (R. sylvestris; Ger. Em. 240.)—Leaves simply lyrate. Pod round, jointed, even, of one cell.—A troublesome weed in the cornfields of Europe, flowering in June and July. The root is annual, small, and tapering. Stem branched, round, glaucous, rough, with prominent bristles, leafy. Leaves rough, lyrate; the upper ones oblong, simply toothed. Flowers numerous, lemon-coloured, changing to white in decay; with pale veins; sometimes the petals are white from the first. Pods cylindrical, or rather tapering, beaked, knobbled or imperfectly jointed, smooth, becoming fleshy as they ripen. In a young state they are divided into two cells, but the partition is obliterated, and coalesced in one fpyngous mass, as they ripen. Linnaeus was of opinion that the seeds of this plant caued a convulsive disease, thence termed by him Raphania, of which he has given a history in Amer. Acad. v. 6. 370, with a figure, and elaborate synonymy of the plant. We have never met with any circumstance to corroborate this hypothesis.

4. R. maritimus. Sea Radish. Linn. Eng. Bot. t. 1643. Ait. n. 3. (R. Raphanistrum; Fl. Brit. t. 723. R. maritimus, flore luteo, silique articulatæ, secundum longitudinem eminenter striatis; Rau. Syn. 296. Raphanistrum silique articulata striata maximæ; Morif. v. 2. 266. Rau. Hlth. v. 1. 366.)—Radical leaves interruptedly lyrate. Pod round, jointed, smooth, deeply furrowed, of one cell. Found on the sea-shore in various parts of Britain, flowering in May. The late Rev. Dr. Walker, and Mr. J. Mackay, observed it on the western coasts of Scotland; and the former cultivated this plant, till his death, as an eufulent root, preferable to horse radish; he also found that cattle were very fond of the leaves. Mr. Turner and Mr. W. Borrer gathered the fame on rocks, near Beachy Head, Sussex. The root is large and succulent, lasting two or three

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RAPHANUS.

three years. *Stem* three or four feet high, round, roughest at the base. *Leaves* all rough, and rarer sharply toothed; the radical ones interruptedly lyrate, which we have never observed in the last-described species. *Flowers* of a deeper yellow, and less veiny. *Pods* strongly jointed, and very deeply furrowed longitudinally, delitute of hairs or other roughnesses. There can be no doubt of this being a distinct species from the former, though generally confounded therewith.

5. R. *tuberous*. Siberian Radish. Linn. Sp. Pl. 935. Murray Comment. Gott. for 1775. 48. t. 11. (R. n. 28; Gmel. Sib. v. 3. 266.)—Leaves pinnatifid, somewhat toothed. Pod round, beaded, downy, of one cell.—Native of Siberia. The seeds were sent by Professor Pallas to the Goettingen garden, where the plant flowered in June. *Root* annual, long, and slender. *Stems* from three to five inches high; or more, as the seeds ripen, ascending, leafy, hairy, simple or branched. *Leaves* sometimes elegantly and neatly pinnatifid, almost pedate, either in a simple or interrupted manner, roughish at the edge only, sometimes more dilated, with distant and broader lobes. *Flowers* large, yellow, sweet-scented in an evening, their petals strongly margined. *Pods* inflamed, copiously and neatly beaded in appearance, rather than diffusely jointed, downy, each with a sharp taper beak.

6. R. *tenuifolius*. Slender Purple Radish. Pallas Trav. v. 3. append. 741. t. L. f. 3. Willd. n. 5. Ehrb. Sel. n. 38. (Chorispermum tenuilifolia; Brown in Ait. H. Kew. v. 4. 129.)—Leaves smooth, oblong, toothed; the lowermost pinnatifid. Pod awl-shaped, jointed, smooth, of two cells.—Native of deferts near the Caspian sea. A hardy annual in our gardens, flowered in June and July. *Root* long, simple, tapering, and slender. *Herb* smooth, scarcely branched, leafy. *Leaves* elliptic-oblanceolate, toothed or pinnatifid, tapering down into longish footstalks. *Flowers* small, purple. *Beak* of the pod very long and slender. The ingenious Mr. Brown separates this from *Raphanus* chiefly, as it seems, because the cotyledons are flat, not folded.


8. R. *lanceolatus*. Lanceolate Radish. Willd. n. 7.—"Leaves oblong-lanceolate, somewhat toothed at the apex. Pod tumid, smooth, two-celled, with a squarish beak."—Native of the Wett Indies. *Stem* a foot and half high, erect, zigzag, with short branches, smooth like every other part of the plant. *Leaves* falched, oblong-lanceolate; the uppermost lanceolate, narrow, entire; the lower ones bluntly toothed at the extremity. *Flowers* of a middling size, yellow, in a terminal cluster, six inches long. *Pods* half an inch long, with a long, obtuse, obscurely quadrangular beak. *Willdenow.*

9. R. *pilosus*. Hairy-falched Radish. Willd. n. 8.—"Leaves lanceolate-linear, pinnatifid at the base. Stem rough with brilly hairs. Pod round, smooth, jointed, of one cell."—Native of Guinea. *Stem* two feet, or perhaps more, in height, branched, divaricated. *Leaves* three inches long, narrow, smooth, pointed; pinnatifid at the base; toothed in the middle; entire at the extremity. *Clusia* auxiliar from every leaf, of few flowers. *Pods* an inch and half long, round, jointed, of one cell, with a short beak, all of them turned one way. *Willdenow.*

R. *erucoides*, Linn. Suppl. 299, is rightly referred by Mr. Brown, in Ait. H. Kew. v. 4. 126, to *Sinapis Alliata*, Jacq. Hort. Vind. v. 2. t. 168. *Willd. Sp. Pl. v. 3. 557. (See *Sinapis*) Willdenow cites it, doubtfully, under *Brassica Chrysanthus* of Villars, a very different plant; for which he also by mistake quotes Barcel. 1c. t. 1016, a synonym properly belonging to *Sisymbrium Barrelieri.*

Linnaeus once referred *Bunus Calile* to this genus of *Raphanus*.

*Raphanus*, in Gardening, contains plants of the herbaceous, annual, esculent kind, of which the species cultivated is, the common garden radish (R. sativus).

There are several varieties; some of which have the appearance of distinct species, from their shape, size, and colour of the roots; as the long-rooted, which is that commonly cultivated in kitchen-gardens for its roots. Of this there are several subordinate variations: as the small-rooted, and the long-rooted striped radish. The small-rooted is most commonly preferred by the gardeners near London, as they require much less room than those with large tops; for as forward radishes are what produce the greatest profit to the gardener, and these are commonly sown upon borders near hedges, walls, or pales, the large-topped sorts would be apt to grow mosty at top, and not swell to much in the root as the other, especially if the plants should be left pretty close.

The small round-rooted, which is not very common here, but in many parts of Italy it is the only one cultivated; the roots of this are very white, round, small, and very sweet. It is now frequently bought to the London market in the spring, generally in bundles, and is sometimes mistaken there for young turnips; when eaten young, it is crisp, mild, and pleasant.

The large turnip-rooted, or white Spanihs, which has a moderately large, spheroidal white root, and is esteemed chiefly for eating in autumn and the early part of winter. Both these sorts are commonly called indiscriminately turnip radishes.

The black turnip-rooted Spanihs, which has a root like the preceding, white within, but with a black skin; and is greatly esteemed by many for autumn and winter eating. There are likewise some other sub-varieties of the radish noticed by gardeners, as the common salmon radish, and the short-topped early salmon radish. Also the small red turnip-rooted radish. Gardeners, too, often call the long-topped sort the fallad radish.

Method of Culture.—These are raised from seed by different sowings from the end of October till April, or the following month. They should have a light fine mould, and the more early sowings be made on borders, under warm walls, or other similar places, and in frames covered by glaesses. The common spindle-rooted, short-topped sorts are mostly made use of in these early sowings, the seed being sown broadcast over the beds after they have been prepared by digging over and raking the surface even, being covered in with a flight raking. Some few carrots with the early crops of radishes.

It is usual to protect the early sown crops in the borders, during frosty nights and bad weather, by mats or dry wheat straw, which should be carefully removed every mild day. By this means they are brought more forward, as well as form better roots. When mats are used, and supported by pegs or hoops, they are readily applied and removed.
A second more general sowing should be made in January or February. When the crops have got their rough leaf, they should be thinned out, where they are too thick, to the distance of two inches, as there will be constantly more thinning by the daily drawing of the young radishes.

When the weather is dry in March, or the following month, the crops should be occasionally well watered, which not only forwards the growth of the crops, but increases the size of the roots, and renders them more mild and crisp in eating.

And the sowings should be continued at the distance of a fortnight, till the latter end of March, when they should be performed every ten days, until the end of April or beginning of the following month. In fowining these later crops, it is the practice of some gardeners to sow cobs-lettuces and spinach with them, in order to have the two crops coming forward at the same time, but the practice is not to be much recommended, where there is sufficient room.

But in fowining the main general crops in the open quarters, the market-gardeners generally put them in on the same ground where they plant out their main crops of cauliflowers and cabbages, mixing spinach with the radish-seed as above, fowing the seeds first, and raking them in, then planting the cauliflowers or cabbages; the radishes and spinach come in for use before the other plants begin to spread much, and as soon as those small crops are all cleared off for use, the ground all over to kill weeds and loosen the soil, drawing earth about the items of the cauliflowers and cabbages.

The turnip radish should not be sown till the beginning of March, the plants being allowed a greater distance than for the common spindle-rooted sort. The seeds of this sort are apt to degenerate, unless they are set at a distance from that kind.

The white and black Spanish radishes are usually sown about the middle of July, or a little earlier, and are fit for the table by the end of August, or the beginning of September, continuing good till frost spoils them. These should be thinned to a greater distance than the common sort, as their roots grow to a large as turnips, and should not be left nearer than six inches.

To have these roots in winter, they should be drawn before hard frost comes on, and laid in dry land, as practised for carrots, carefully guarding them from wet and frost; as in this way they may be kept till the spring.

In regard to the culture of the general crops, they require very little, except occasional thinning where they are too thick, when the plants are come into the rough leaf, either by hoeing or drawing them out by hand: though for large quantities, small hoeing is the most expedient mode of thinning, as well as most beneficial to the crop by loosen ing the ground; in either method thinning the plants to about two or three inches distance, clearing out the weakest, and leaving the strongest to form the crop.

In order to save the seed, about the beginning of May some ground should be prepared by digging and levelling; then drawing some of the strawcovered and bell-coloured radishes, plant them in rows three feet distant, and two feet alhund in the rows; obviating, if the season be dry, to water them until they have taken root: after which they will only require to have the weeds hoed down between them, until they are advanced so high as to overspread the ground.

When the seed begins to ripen, it should be carefully guarded against the birds. When it is ripe, the pods will turn brown: then must be cut, and spread in the sun to dry; after which it must be thrashed, and laid up for use where no mice can come at it.

Method of Culture on Hot-beds.—This method is sometimes practiced in order to have the roots early, as in January or the following month. They should have eighteen inches depth of dung to bring them up, and fix or seven inches depth of light rich mould. The seed should be sown more moderately thick, covering it in half an inch thick, and putting on the lights: the plants usually come up in a week or less; and when they appear, the lights should be lifted or taken off occasionally, according to the weather; and in a fortnight this the plants to the distance of an inch and half or two inches, when in six weeks they will be fit to draw. Where there are no frames to spare, the beds may be covered with mats over hoops, and the sides secured by boards and straw-bands. And when in want of dung, if the beds be covered with frames, and the lights put on at right and in bad weather, the plants may be raised for use a fortnight sooner than in the open borders.

RAPHE, in Anatomy, a Greek term, signifying future, applied to some parts of the body; thus we have the raphe corporis calloti in the brain (see BRAIN); raphe perinei, feroti, and penis. See Generation.

RAPHENGIUS, sometimes called Raphenhius, Francis, in Biography, a learned orientalist, was born in 1539 at Lanoy, near Lille, in Flanders. He had the early part of his education at Ghent, but on the death of his father, it was intended to bring him up to trade, and for that purpose he was sent to Nuremberg. Here he had access to books, resumed his studies, and took an opportunity of going to Paris, where he made great progrès in the Greek and Hebrew languages. The civil wars obliged him to quit France, and he came to England, where, for some time, he taught Greek in the university of Cambridge. After this he returned to the Low Countries, and became a corrector of the presses to the celebrated printer Plantin, whose daughter he married in the year 1565. He made himself very serviceable in the printing office, especially with respect to the famous Antwerp Polyglot Bible, printed in 1571 by order of Philip II. of Spain. When Plantin removed to Leyden, he left his business at Antwerp under the care of Raphelengius, and upon his return the latter went to Leyden. The curators of the university of that place conferred upon him the professorship of Hebrew, to which was added that of Arabic. He died in 1597. His literary works were "Variae Lectiones et Emendationes in Chaldæis Bibliorum Paraphraesin," "Grammaticæ Hebrew," "Dictionarium Chaldæicum," and "Lexicon Arabicum." He had a son of the same name, a man of talents and learning, who published "Notes upon Senea's Tragedies," and "Eulogies, in Verse, of fifty Perfons, with their Portraits."

RAPHIA, in Botany, from jas, a point or needle, so that it ought to have been Raphis, a genus of Palms, with a very pointed fruit, established by Palliot Beauvois, in his Flore d'Ouvrre et de Brin, t. 8.

RAPHIA, in Ancient Geography, a famous city in the Mediterranean, between Gaza and Rhinocorura. This was perhaps Gath of the Rephaim. Raphia is famous for the victory of Philiopator, king of Egypt, over Antiochus the Great, king of Syria. (3 Maccab. 1. 11.) Josephus says (Antiq. i. xiii. c. 21.) that Raphia was taken by Alexander Jannæus, and after being ruined in the wars, was repaired by Gabinus. There are extant some ancient medals struck at Raphia, and some historians of this city are found in the lists of the calven counsels.

RAPHIDIA, in Entomology, a genus of insects of the order Neuroptera, of which there are two species. The generic character is as follows; Mouth with a curved toothed
toothed horny mandible; the thorax is long and cylindrical; it has three femmata; the wings are deflected; the antennæ filiform, as long as the thorax, the anterior part is elongated and cylindrical; it has four feelers, which are short and filiform; the tail of the female is terminated by a large recurved bristle.

* Ophiopus. The wings of this species are immaculate. It inhabits divers parts of Europe in woods, and preys on other insects.

* Notox. Wings with a brown marginal spot. It inhabits England, and has been thought to be only a variety of the former. The body is black; the head is also black with a tectaceous spot; the legs are tectaceous; the appendage of the female is as long as the body.

Raphoe, in Geography, a bishopric of Ireland, in the ecclesiastical province of Armagh, which comprises the greater part of the county of Donegal, being 44 miles in length from north to south, and 32 in breadth, comprehending 515,250 Irish acres. It contains 31 parishes, in which are 32 churches. The dean, archdeacon, and four prebendaries, compose the chapter. The patronage of 6 parishes, which form the corps of the deanery, is in the crown; of 15 others, in the bishop; of 7, in the university of Dublin; and of 3, in lay hands. It is not precisely known at what time this fee was founded, but it must have been as early as the ninth century, since bishops of Raphoe are mentioned at that time. Beaufort.

Raphoe, a small post-town of Ireland, the parish church of which serves as a cathedral, where is the bishop's palace. It is 107 miles N. by W. from Dublin.

Raphone, a township in Lancaster county, Pennsylvania, containing 284 inhabitants.

Raphoun, in Ancient Geography, a city beyond Jordan, on a brook, not far from Caraim.

Rapicio, Grovita, in Biography, an Italian man of letters, was born about the year 1480, at Chieri, in the territory of Brevia. Devoting himself to the instruction of youth in literature, he first opened a school at Bergamo, where he wrote a Latin treatise on the education of youth, which was afterwards printed at Venice. He next taught at Vicenza, and various other cities in Italy, and was for many years employed at Venice in instructing, in polite literature, the youths defined for public life, and among others, the care and instruction of the sons of cardinal Bembo were devolved upon him. Cardinal Pole, in one of his letters, speaks of Rapicio in high terms of commendation. He died at Venice in 1553. He was author of various harangues, poems, and epistles, but his chief work was entitled "De numero Oratorio," in five books, printed at Venice in 1544. "In this," says his biographer, "he minutely investigates the principles of writing the Latin language with sweetness and harmony, and he replies to Melanchthon's affections, that rules of this kind are rendered useless by our ignorance of the ancient pronunciation. Moreci."

Rapidean, in Geography, a small river of Virginia, which runs into the Rappahanock, about 10 miles above Fredericksburg.

Rapide, Ilse au, a small island of Upper Canada, in the river St. Lawrence, in front of the township of Matilda, containing about 200 acres.

Rapide, a river which runs into Hudson's Bay.

Rapides, a county of the territory of Orleans, containing three parishes, viz. Rapides, including 2200 inhabitants, Catahoula 1164, and Avoyelles 1209.

Rapier, properly denotes a long, ordinary, old-fashioned cutting sword, such as those worn by the common folders.

The word is formed from the French rapiere, of the Greek ῥαπίς, κερατός, to finite, or 

In this sense do the French still use the term; so that among them, to take the rapier, is to enter in the army.

Rapier, in a modern sense among us, usually denotes a small sword, as contradistinguished from a back-sword, or cutting-sword.

Rapillo, in Mineralogy, the name given by the Italians to the sand or powders (improperly called ashes) thrown out of the crater of volcanoes in immense quantities, towards the conclusion of an eruption. See Volcano, and Volcanic Products.

Rapin, René, in Biography, a Jesuit, was born at Tours in 1621. He entered the society in 1639, and was a teacher of the belles lettres in it during nine years. He became eminent by several publications in the Latin and French, and obtained a high rank among the literary characters of his time. It is, however, as a Latin poet that he is chiefly known: his didactic poem on Gardens, entitled "Hororum, lib. iv," first printed in 1665, has passed through many editions, and has been regarded as one of the most elegant and classical pieces of modern Latin verse. By others it has been thought a work of art and study, rather than an effort of poetical feeling and fancy, and treats on gardening more as a branch of rural economy than as one of the fine arts. His other Latin poems are sacred elegies, heroic, elegiac, and lyric poems. Father Rapin died at Paris in 1687. He was no les esteemed for his virtues and amiable qualities, than admired for his talents; and he polished all that polish and grace for the society of the great world, which have distinguished this order from other religious communities. His works were collected and published, in 3 vols. 12mo. 1681. There is a fine edition of his "Hororum," published by Brotiol at Paris, in 1786. Rapin was great as a critic, in which line he is known by his "Reflexions sur l'Eloquence, fur la Poésie, fur l'Histoire, et fur la Philosophie," and also by his "Comparaisons de Virgile et d'Homer," printed in 2 vols. 4to. Bayle. Moreci.

Rapin de Thoyras, Paul, well known as the historian of England, was born at Caufres, in Languedoc, in 1661. He was descended from a noble family of Savoy, which came into France in the reign of Francis I., for the sake of professing the reformed religion. The subject of this article, after having received his education, went to his father, who was an advocate in the chamber of the edict of Nantes, for the purpose of studying the law. He was in due time admitted an advocate, but the chamber being suppressed in the same year, he went with his father to Toulouf. On the revocation of the edict of Nantes, in 1685, he withdrew to England, after which he went to Holland, and entered into a company of French cadets at Utrecht. In 1689 he followed the prince of Orange into England, and obtained an encomium in lord kingston's regiment, which went to Ireland. He was engaged in several battles, particularly at the siege of Carrickfergus and Limerick, and at the battle of the Boyne, and so much distinguished himself, that he obtained a captain's commission. In 1693 he was nominated governor to the son of the earl of Portland, reigned his commission to a younger brother, and received from the crown, for his part services, 100l. a year. He travelled to different countries in company with his pupil, and resided with him some time at the Hague. By the death of king William he was deprived of his pension, and his engagement as private tutor being over, he retired, in 1707, to Weif, in the duchy of
of Cleves, where he devoted himself to the composition of the history of England. Here he died in 1725. He had, previously to his decease, published in the year 1717, "Dissertation sur les Whigs et Tories," which was translated into English. His great work, "L'Histoire de l'Angleterre," was printed at the Hague in 9 vols. 4to. in the years 1725-6. It commences with the remotest periods, and is brought down to the proclamation of William and Mary. It has been twice translated into our own language, and was, till the appearance of Hume, the most popular history of England, and Tindal's, or rather Birch's, and other continuations, have been adapted to it. It is written in a proflix and unamiated stile, but deserves the praise of much solid information.

"His work," says an excellent writer, "is of great authority, on account of his perpetual references to original documents, and the ample quotations which he frequently makes from important state papers, confer upon it additional value. He has so copiously detailed the matters which were agitated in the turbulent, but prudent parliament of Charles I., as to give a clear view of the rife of those parties which to this day divide the people of England. On the dark and horrible transactions of the reign of Charles II. he perhaps throws as much light as it is now possible to obtain. In reference to that important period, he has flated historical difficulties with candour, and in discussing the merits and demerits of parties, he has weighed evidence with laudable scrupulousness." (See Shepherd's "Systematic Education.") Rapin, during the collection of his materials, undertook the useful labour of making an "Abrégé de Rymer's Fossae," which was published in Le Clerc's "Bibliothèque Choixée;" and translated into the English by Mr. Stephen Whatley, and published in 1735, under the title of "Acta Regia," and in folio.

RAPINE, RAPINA, in Law. To take a thing in private; against the owner's will, is properly theft; but to take it openly or by violence, is rapino, or robbery.

RAPINIA, in Botany, was so called by Loureiro, Fl. Cochinch. 127, after father René Rapin, a French Jesuit, author of an elegant Latin poem on gardens, who died in 1687, aged 66. If this writer contributed nothing to improve the science of botany, he has, doubtless, helped to promote a love of plants, and may therefore claim a botanical wreath. A Jesuit of his day is doubly entitled to respect, for having, like the good Loureiro, turned his mind to an elegant and improving pursuit, from those two corruptors of the human heart and understanding, political intrigue, and scholastic divinity; in which most of his brethren fought their temporal, and often nobly their eternal, good. The Rapinia of Loureiro however, proved, on the examination of his specimens by the late Mr. Dryander, to be the Sphnuclea of other authors; and this last-mentioned name is now generally adopted. See that article.

RAPINO, in Geography, a town of Naples, in Abruzzo Citra; nine miles S. of Civita di Chieti.


Gen. Ch. Cal. Perianth inferior, of four oblong, spreading, deciduous leaves, gibbous at the base. Cor. cruciform, of four obovate, entire, spreading petals, whose claws are shorter than the calyx. Stam. Filaments fix, about the length of the calyx, the four opposite ones rather the longer; anthers simple. Pet. Germin oblong; style awl-shaped, the length of the calyx; stigma obtuse. Pers. Pouch lenticular, pointed, corrugated, of two cells, and two cohering, not spontaneously separating, coriaceous valves; partition membraneous. Seeds roundish, solitary in each cell; cotyledons flat.

Eff. Ch. Calyx spreading. Pouch of two cells, and two convex valves, not burking.

1. R. paniculatum. Panicked Rapistrum. Ait. n. 2. (R. arvense, folio auriculato acute; Tourn. Infl. 211. Myagrum paniculatum ; Linn. Sp. Pl. 894. Wildl. Sp. Pl. v. 3. 409. Fl. Dan. t. 204. Myagrum simul, frugua rotundata; Bauh. Prodr. 52.)—Native of cultivated fields in various parts of Europe, from Sweden to Greece, but not, as yet, observed in Britain. Root annual, tapering. Stem about two feet high, erect, round, roughish, leavy, branched. Leaves oblong, acute, undivided, rough, somewhat toothed, clasping the item with their arrow-shaped base. Flowers small, yellow, in numerous clusters, which become greatly elongated when in fruit. Pouch scarcely bigger than mustard, a little abrupt, finely reticulated. One of the seeds is often, but not always, abortive. Mr. Brown refers to this genus the Búnia eúspitak of Linnaeus, which agrees with our R. paniculatum in having flat, not spirá, cotyledons, but has otherwise the characters of Búnia.

Rapistrum is also a species of the fow-cabbage, or crumbs.

RAPOLLA, in Geography, a town of Naples, in Basilicata, the see of a bishop, united to Melì; six miles W. of Venosa. N. lat. 45° 58'. E. long. 15° 44'.

RAPORE, a town of Naples, in Principato Ultra; 9 miles E. of Conza.

RaposO, a town of South America, in the country of Popayan.—Allo, a river of Popayan, which runs into the Pacific ocean, N. lat. 3° 48'.—Allo, a small island in the Pacific ocean, near the coast of Popayan. N. lat. 4°.

RAPPAHANOCK, a large navigable river of Virgin- ia, which rises in the Blue Ridge, and runs about 130 miles from N.W. to S.E., and enters into Chesapeak bay, between Windmill and Stingray points. It waters, in its course, the towns of Falmouth, Frederickburg, Port-Royal, Leeds, Tappahannock, and Urbonne.

RAPPE, in Commerce, a money of account in Switzerland, 10 of which are equal to a good hat; and 6 are equal to a plattet, shilling, or escalin. This is the cafe at Basel, but at Lucern the plattet is only 3 rappen, and the Zurich escalin = 32 rappen.

Rappe, in Ichtyology, a name given by some to the capito fluviatili rapas of Gfner, more frequently known by the name of the coropus piceus.

RAPPERSCHWEIT, in Geography, a town of Switzerland, and capital of a distict to which it gives name; situated on the S. side of the lake of Zurich, over which there is a bridge, 1852 paces in length, built in 1358 by the counts of Habsburg. The town was founded in 1091, and formerly had its own counts. In 1358 it was sold to the Sons of Albert, archduke of Austria. In 1464 it put itself under the cantons of Uri, Schwitz, Unterwalden, and Glarus, with a revere of its liberties; but the cantons gradually made themselves masters of it. At the peace of Aarau in 1712, its liberties were restored, though the country remains subject to the sovereignty of Zurich and Berne; 15 miles S.E. of Zurich.

RAPPIN, a town of Anterior Pomerania; 7 miles N. of Bergen.
RAPPO Rappo, a bay on the coast of Mowee, one of the Sandwich islands.

RAPPOLTSKIRCHEN, a town of Austria; five miles S. of Tun.

RAPPORT, Fr. in Myric, is sometimes used for proportion, and sometimes for relation, words which will be explained in their places.

RAPPS, in Geography, a town of Austria, on the river Tay; four miles S.W. of Drofenord.

RAPSO, a town of Ilthia; 52 miles S.E. of Capo d’Ilthia.

RAPTEC, a river of Hindoostan, which runs into the Dewah, five miles S.W. of Sellempour.

RAPTU HEREDIS, in Lavo, an ancient writ which lies for taking away an heir, holding in foage; of which there are two forts; one when the heir is married, the other when not. See Ravishment.

RAPTURE, RAPTURA, an extasy, or transport of mind. See Extasy, Exultation, Rhapsody, &c.

RAPUNCULUS, in Botany, the Rampion, owes its name to a resemblance in the root to a Rape, or oblong Turnip. This root, Campanula Rapunculus of Linneus, is biennial, scarcely larger than a radish, which it resembles also in shape, but the colour is white. Its flavour is sweet and mild, notwithstanding some degree of milkiness in the juice, in which it accords with other, usually bitter and acrid, species of its genus. The Rampion is now much less cultivated than formerly, and almost a stranger at our tables.

RAPUNTUM, a name used by Tournefort and Morison for some plants referred to Lobelia by Linneus. (See Lobelia.) Gortner, having adopted Plumier’s Lobelia, the Linnean Scutella, restores Rapuntum; but such a misnomer could now lose to inconvenience only.

RAPUTIA, so called by Aublet, because the plant grows in the forests of Orope in Guiana. Jullieu and Lamarck have retained this curious name. Schreber has changed it for Scutella; see that article hereafter.

RARAKIT, in Geography, a town of the island of Ceram, at the foot of a mountain covered with trees, which serves as a harbour for pirates.

RARE, in Physics, denotes a body that is very porous, whose parts are at a great distance from one another, and which contains but little matter under a great deal of bulk.

In this sense rare flands opposed to dense.

The corporeal philosophers, e.g. the Epicureans, Gafendorffs, Newtonians, &c. assert that bodies are rarer some than others, in virtue of a greater quantity of vacuum included between their pores. The Cartesians hold, that a greater rarity only consists in a greater quantity of matter subtilis included in the pores. Lastly, the Peripatetics contend, that rarity is a new quality superinduced upon a body without any dependence, either on vacuum, or subtile matter.

RARECOURT, in Geography, a town of France, in the department of the Meuse; 10 miles S.W. of Verdun.

RAREE, a town of Hindoostan, in Concan; 20 miles N.N.W. of Goa.—Also, a town of Hindoostan, in Bahar; 11 miles N.N.W. of Durlungah.

RAREFACTION, Rarefactio, in Physics, the act by which a body is rendered rare; that is, is brought to pollens more room, or appear under a larger bulk, without accession of any new matter.

Rarefaction is opposed to condensation.

Our more accurate writers restrain rarefaction to that expansion of a mass into a larger bulk, which is effected by means of heat. All expansion from other causes they call dilatation.

The Cartesians deny any such thing as absolute rarefaction: extension, with them, constituting the essence of matter, they are obliged to hold all extension equally full.

Hence, they make rarefaction to be no other than an accession of freth, subtile, and infensible matter, which, entering the parts of the body, sufficiently diffuses them. See this disproved under Vacuum.

It is by rarefaction that gunpowder has its effect; and to the same principle also we owe our zolipakes, thermometers, &c.

The degree to which the air is rarefiable exceeds all imagination: Merlennus, long ago, by means of an intense heat, found that air might be rarefied so as to pollens more than seventy times its former space.

Mr. Boyle afterwards found, that air, by its own elasticity, and without the help of any heat, would dilate itself so as to take up nine times its former space; then 31 times; then 60; then 150; at length, by many degrees, he found it would reach to 8000 times; then 10,000, and finally to 13,579.

Such is the rarefaction of common air, from its own principle of elasticity, and without any previous condensation; if but it be compressed, the same author found its greatest space when most rarefied, is to its least when most condensed, as 55,000 to 1.

Such an immense rarefaction, Sir Isaac Newton shews, is inconceivable on any other principle than that of a repelling force inherent in the air, by which its particles mutually fly from one another.

This repelling force, he observes, is much more considerable in air than in other bodies, as being generated from the most fixt bodies, and that with much difficulty, and scarcely without fermentation; those particles being always found to fly from each other with the most force, which, when in contact, cohere the most firmly. See Air.

The members of the French Royal Academy have bestowed much attention on the different rarefacions, or rather the different rarities of the air at different heights. M. Mariotte established this as a principle, from experiments, that the different rarefacions, or condensations, of the air, follow the proportion of the weights with which it is pressed.

Hence, supposing the mercury in the level of the sea suspended to twenty-eight inches, which is the weight of the whole atmosphere; and that fifty feet height of air are equivalent to a line, or one-twelfth of an inch of mercury; so that the barometer, at the height of fifty feet from the sea, would fall a line; it is easy finding what height of air would be equal to a second, or any other line of mercury: for as twenty-eight inches of mercury one-twelfth are to twenty-eight inches, so is the height of sixty feet of air to a fourth term, which is the height of air corresponding to a second line of mercury.

And after the same manner may the height of air corresponding to each line be found, which will make a geometrical progression, the sum of which will be the whole height of the Atmosphere (which see); and, of consequence, a certain part of that sum will be the height of a mountain, at whose top the barometer shall have sunk a certain quantity.

Mellers, Culliini and Maraldi, upon measuring the heights of several mountains, found, that this progression of M. Mariotte was defective; that it always gave the height of the mountains, and consequently the rarefacions, less than they really were; and from some further experiments, M. Amon-
RAS

Ras Mohammed, a cape on the coast of Arabia, in the Red sea. N. lat. 27° 54'.

Ras al Mar, a town of Perßia, in the province of Segelgian; 200 miles S.W. of Zareng.

Ras al Nafoj, a cape of Egypt, in the Red sea. N. lat. 23° 10'.

Ras Rouche, a cape on the E. coast of Arabia. N. lat. 21° 55'.

Ras Viré, a cape on the coast of Arabia, forming the S. point of the gulf of Curia Maria. N. lat. 17° 25'.

Ras Zafrazione, a cape on the coast of Egypt, in the Red sea; 32 miles S.S.E. of Suez. N. lat. 29° 14'.

RASA, a small island in the Indian sea, near the coast of Africa. S. lat. 17° 48'.

RASAIN, a town of Perßia, in the province of Farfallan; 110 miles N.W. of Schiraz or Shiraz.

RASAL, or Rasal-sem, Cape, a cape of Africa, on the coast of Tripoli. N. lat. 32° 36'. E. long. 21° 10'.

RASALEMA, a river of Africa, which waters the city of Fez.

RASALGATA, Cape, or Ras Roufe, a cape on the E. coast of Arabia. N. lat. 22° 24'. E. long. 58° 15'.

RASANT, or Rasant flank, in Fortification. See Flank.

The defence of the baflion is rafant.

RASANT Fire. See Fire.

RASC, in Geography, a river of Servia, which joins the Ibar; 16 miles N.E. of Jenobafar.

RASCETA, a word used by the Arabian physiscons to express the wrift or ankle.

RASCH, in Geography, a town of Bavaria, in the territoty of Nuremberg; two miles S.S.E. of Altorf.

RASCHNA, or RIZANA, a town of Servia; eight miles S. of Parakin.

RASCHWITZ, a town of Bohemia, in the circle of Leitmeritz; four miles E. of Außche.

RASCIA, a port of Servia, watered by the Rasca.

RASCINES, a town of Spain, in the province of Bilbao; 21 miles S.E. of Santander.

RASE, RASARIUM, in our Old Writers, feems to have been a meafure of corn now difufed; toll shall be taken by the rafe, and not by the heap or cantel.

RASE, in the Manoe. To rafe, or glance upon the ground, called in French raser le fapis, is to gallop near the ground, as our English horfes do.

RASEB, Al, in Geography, a fortified pafs in the mountains of Grand Bucharia; 60 miles N. of Vafihgerd.

RASEBORG, a fear-port town of Sweden, in the gulf of Finland; 30 miles S.E. of Abo.

RASEC, a town of Perßia, in the province of Segelgian; 60 miles S.W. of Zareng.

RASGRAD, or RAGHRAT. See HRASGRAD.

RASH, in Clock-Work. See RATCH.

RASH, in Medicine, an erupion or efflofence upon the skin, thrown out in fevres, or forthes.

RASHAUA, in Geography. See RASSAGUL.

RASHED, a town of Nubia, in Sennaar; 15 miles N. of Gefflin.

RASICULMO, Cape, a cape on the N. coast of Sicily. N. lat. 38° 18'. E. long. 12° 49'.

RISTER, or RAZIERE, in Commerce, a meafure of corn in Dunkirk and Flanders. At Dunkirk, they have the fæ raifer, and the land raifer; 8 of the former being = of the latter; 54 farifers or 60 land raifers answer to 31 English quarters. Each faifer contains 9884 inches, and each land raifer contains 8786 inches; 17 40 of the former, and 19 57 of the latter, are equal (each) to 10

English
RAS

English quarters. At Dixmude 29.51 raiieres are equal to 10 English quarters, and each raiiere contains 582 1 inches.

At Gravelines 21.29 raiieres are equal to 10 English quarters, and each contains 8080 inches. At Nieuport 16.93 raiieres are equal to 10 English quarters, and each raiiere contains 10177 cubic inches. At St. Omer 21.77 raiieres = 10 English quarters, and each contains 7900 cubic inches. At Liife or Lille, the raiiere is divided into 8 parts; of these there are two forts, one, used for wheat or rye, the other, called raiiere de Mars, for oats or beans; 38 of the former, and 40 of the latter, are reckoned for one lot. The raiiere of wheat weighs about 128 lbs. and of these are equal to 19 feet, Paris measure, or about 10 English quarters; 39.64 raiieres of Liife are equal to 10 English quarters, and each contains 4339 cubic inches.

RASILIS ÆRUGO, in the Material Medica of the Ancients, one of their kinds of verdigris. It was prepared in the following manner; they took some sharp vinegar over the fire in a strong earthen vessel, and covered it with a bras pot inverted, well cleaned, and without any vent-hole. And after some time the vessels were to be separated; and the verdigris, which was found concreted on the inside of the bras pot, was scraped off, and put up for use.

RASILITA, in Geography, a town of Italy, in Friuli; 26 miles S.S.E. of Friuli.

RASIN, a town of Hindooftan, in Dowlatabad; 18 miles W.S.W. of Carmullah.

RASINTA, a town of Italy, in Friuli; 14 miles N. of Udina.

RASKOW, a town of Poland, in the palatinate of Braclaw; 34 miles S. of Braclaw.

RASMAN, an island in the Red sea. N. lat. 13° 58'.

RASMEND, a mountain of Peru, in the province of Hrakt; 60 miles N.E. of Havelnad.

RASON, an island in the Adriatic. N. lat. 44° 6'.

E. long. 15° 25'.

RASO, or Ell of Turin, in Commerce, is equal to 22 Ge- noeis palms, or 23 English inches; the foot 143.2 French lines, or 37 English inches; hence 180 Piedmontese rai are equal to 119 English yards, and 33 Piedmontese feet = 35 English feet. At Cagliari, 166.7 rai = 100 English yards, and each of them equal to 21.6 English inches. At Chamberry 158.5 rai = 100 English yards, and each = 22.7 English inches. At Nice, 166.7 rai = 100 English yards, and each = 21.6 English inches; 154.5 rai of Turin = 100 English yards, and each = 23.3 English inches.

RASP, a coarse sort of file.

RASCH, in Geography, a town of Austria; eight miles E. of Zwiet.

RASATORIUM, (from rado, to scrape), a surgical instrument with which the peritoome was, by the old practitioners, scraped from the bones, and the bones themselves sometimes rasped.

RASPBERRY BUSH, in Botany. See Rubus.

For the dietetic and medicinal use of raspberries, see Summer Fruits.

RASPECON, in Ichthyology, a name given by some to the uranoscopfe, or stargazer.

RASPENBURG, in Geography, a town of Germany, in the principality of Weimar, near which are some medicinal springs; 12 miles N. of Weimar. N. lat. 51° 13'.

E. long. 11° 35'.

RASPHUYS, or Rasp-houfe, a celebrated work-houfe, or houfe of correction, at Amsterdam. See Work-houfe. Vol. XXIX.

RASPUGLY, in Geography, a town of Bengal; four miles S. of Calcutta.

RASSADES, a cluster of small islands, in the river St. Lawrence. N. lat. 48° 15'. W. long. 68° 48'.

RASSAGU, one of the Kurile or Kurillskoy islands, lying 40 versts from Mutova, and in extent about 30 versts measured either way. It has lofty mountains and steep rocky shores, with very few sandy bogs. On the mountains, here and there, is a good forell-foil, birch, alders, and the nut-bearing pine; the vales and flats abound in herbs. On the land is no other animal besides the fox, but the cliffs of the rock afford nesting-places for all kinds of sea-birds; and the beavers and seals lie scattered on several parts of the island. Here are no trees that yield fish. The Kuril on this island are not numerous, and some of them are baptized.

N. lat. 48° 20'. E. long. 154° 14'.

RASSE CORONE, in Natural History, a name given by the Ceylonoese to a particularly fine kind of cinnamon, which is the bark of a tree, growing nowhere but in that island. The name they give it signifies soap or burning cinnamon. This choice kind was formerly exported annually, in considerable quantity, by the Dutch East India company, who prohibited the mixing any other kind of cinnamon with it, under a very severe penalty. Phil. Trans. No. 409.

RASSOULPOUR, in Geography, a town of Hindooftan, in the Circar of Nagore; 22 miles N.W. of Dild-wana.—Alfo, a town of Hindooftan, in the Circar of Go- hud, on the Jumna; 40 miles E. of Gohud.

RASSOVAT, or Axiospolis, a town of European Turkey, in Bulgaria; 24 miles N. of Dirlata. N. lat. 44° 25'.

E. long. 27° 37'.

RASTADT, a town of the duchy of Baden, situated on a large plain on the river Merg; the town is new, and regularly built, and the principal street is broad and handsome; 16 miles S.W. of Durlach. N. lat. 48° 52'.

E. long. 8° 15'.—Alfo, a town of Bavaria, in the bishohip of Bamberg; five miles N.W. of Bamberg.—Alfo, a town of the duchy of Wurzburg; three miles S. of Melrichshadt.

RASTAGARA, a town of Egypt; 90 miles E. of Cairo.

RASTEDE, a town of Germany, in the county of Oldenburg; 11 miles N. of Oldenburg.

RASTENBURG, a town of Pruffia, in the province of N. Watangen, founded in 1329, and after having been destroyed by the Lithuanians in 1348, was rebuilt, together with its castle, and put into a better state of defence; it is enclosed by a wall, and, in 1666, surrounded by a rampart. The burghers, most of whom are Lutherans, are about 200. The inhabitants derive their subsistence from a little commerce, breeding, agriculture, and mechanic trades; 46 miles S.E. of Königsberg. N. lat. 53° 58'.

E. long. 21° 27'.

RASTICO HARBOUR, Grand, a bay in the gulf of St. Lawrence, on the N. coast of the island of St. John. N. lat. 46° 23'.

W. long. 62° 50'.

RASTORFF, a town of Austria; seven miles E. of Ehrenprunn.

RASTOWICA, a river of Poland, which runs into the Dnieper, on the borders of Russia.

RASURA, a word used by the pharmacutic writers to express the shavings of woods, or other hard substances, to make them readily yield their virtues by decoction. Physicians also use it to express the corrosion of acrid humours.

RASURE in a Deed, in Law. See DEED.

RASZNA, in Geography, a town of Servia; 24 miles N. of Niffa.

RAT, in Zoology. See Mus.
It has been observed that this country was formerly infested with two kinds of rats, the house-rat and the water-rat; but that it is believed that the latter, within this last half century, has destroyed the former. This is probably, however, only imaginary, since it is well known that the house-rats are frequently brought, in great abundance, into the different sea-ports of the kingdom, in corn, and other vessels. It seems not improbable, but that these different varieties of rats may intermigrate, and that the latter become house-rats, as there is considerable diversity in the colour of the house-rats, some approaching to nearly black, which is the natural colour of the water-rat, while the genuine house-rat is always of a darkish or dapple brown. In their habits they have some circumstances in which they agree, as in that of making burrows in the ground; but the water-rat is capable of living much in the water, and of feeding on fish and other aquatic animals, while the house-rat mostly lives upon grain, and other produce of that kind.

The water-rats are also said, by Dr. Darwin, to eat the foliage as well as the seeds and fruits of vegetables, as he has seen a young rat of this kind devour a large leaf of the water-plantain (alisma plantago). They likewise, as well as the house-rats, are destructive of young animals, such as ducklings, goslings, chickens, and rabbits. But the great mischief which the water-rats produce, is in feeding on, and destroying, the roots of a great variety of vegetables, in their innumerable burrows. The above writer has been known to have seen some new-planted apple-trees taken out of the ground with nearly the whole of their smaller roots eaten, and the larger ones peeled by them. With the house kind, they are, likewise, extremely destructive of the food of poultry, and swine, and of course are highly detrimental near waters. It is remarked by the above able writer, that as these animals, like the dog, are of a lascivious nature, and, as some materials have a strong scent, resembing, perhaps, that of their venereal organs, they are liable to be attracted by such smells, as dogs are, on the same account, he supposes, inclined to roll themselves in putrid carrion; and male cats to eat marum valerian, and cat-mint. It is of this principle that rat-catchers avail themselves, and by inducing the propensity, deceive them to their destruction, by blending with their favourite foods different strong-scented substances, such as the essential oil of rhodium, or musk, with the poisonous powders of ilychnos mus vonica, or of delphinum litavgiaria, or perhaps of arsenic.

The first step taken by rat-catchers, in order to clear a house, &c. of those vermin, is to allow them all together, to one proper place, before they attempt to destroy them; for there is such an instinctive caution in these animals, accompanied with a surprising facility in discovering any cause of danger, that if any of them be hurt, or purloined, in an unusual manner, the rest take the alarm, and become so shy and wary, that they elude all the devices and stratagems of their pursuers for some time after. The place where the rats are to be assembled, should be some closet, or small room, into which all the openings, but one or two, may be secured; and this place should be, as near as may be, in the middle of the house, or buildings. It is the practice, therefore, to attempt to bring them all together in some such place before any attempt be made to take them; and even then to avoid any violence, hurt, or fright to them, before the whole be in the power of the operator. In respect to the means used to allure them to one place, they are various; one of those most easily and efficaciously practised is the trailing some piece of their most favourite food, which should be of the kind that has the strongest scent, such as toadled cheese, or broiled red-herring, from the holes or entrances to their accidies in every part of the house, or contiguous buildings, whence it is intended to allure them. At the extremities, and in different parts of the course of this trailed tract, small quantities of meal, or any other kind of their food, should be laid, to bring the greater number into the tracks, and to encourage them to pursue it to the centre place, where they are intended to be taken; at that place, where time admits of it, a more plentiful repast is laid for them, and the trailing repeated for two or three nights. But besides this trailing, and way-baiting, some of the most expert of the rat-catchers have a shorter, and, perhaps, more effectual method of bringing them together, which is, the calling them, by making such a kind of whistling note as resembles their own call, and by this means, with the assistance of the way-batts, they call them out of their holes, and lead them to the repast prepared for them at the place designed for taking them. But this is much more difficult to be practised than the art of trailing; for the learning the exact notes, or cries, of any kind of heads or birds, so as to deceive them, is a peculiar talent, not easily attained to in other cafes.

And in practising either of these methods great caution must be used by the operator to suppress, and prevent, the scent of his feet and body from being perceived; which is done by overpowering that scent by others of a stronger nature. In order to this the feet are to be covered with cloths rubbed over with allfatetids, or other strong smelling substances; and even oil of rhodium is sometimes used for this purpose, but sparingly, on account of its dearness, though it has a very alluring, as well as disgusting effect. If this caution of avoiding the scent of the operator's feet, near the track, and in the place where the rats are proposed to be collected, be not properly observed, it will very much obstruct the success of the attempt to take them; for they are very shy of coming where the scent of human feet lies very fresh, and intimates, to their fagacious instinct, the presence of human creatures, whom they naturally dread. To the above-mentioned means of alluring by trailing, way-baiting, and calling, is added another of very material efficacy, which is the use of oil of rhodium, which, like the marum valerian, is a very extraordinary and fascinating power on these animals. The oil is extremely dear, and therefore very sparingly used. It is exhaled in a small quantity in the place, and at the entrance of it, where the rats are intended to be taken, particularly at the time when they are to be left brought together in order to their destruction; and it is used also, by inuring it on the surface of some of the implements used in taking them, by the method before described, and the effect it has in taking off their caution and dread, by the delight they appear to have in it, is very extraordinary.

It is usual, likewise, for the operator to disguise his figure as well as scent, which is done by putting on a gown or cloak, of one colour, that hides the natural form, and makes him appear like a poul, or such inanimat thing; which habit must likewise be scented as above, to overpower the smell of his person; and besides this he is to avoid all motion, till he has secured his point of having all the rats in his power. When the rats are thus enticed and collected, where time is afforded, and the whole in any house or out-buildings are intended to be cleared away, they are suffered to regale on what they most like, which is ready prepared for them; and then to go away quietly for two or three nights; by which means those which are not allured the first night are brought afterwards, either by their fellows, or
the effects of the trailing, &c. and will not fail to come duly again, if they are not disturbed or molested. But many of the rat-catchers make shorter work, and content themselves with what can be brought together in one night or two; but this is never effectual, unless where the building is small and entire, and the rats but few in number.

With respect to the means of taking them when they are brought together, they are various. Some entice them into a very large bag, the mouth of which is sufficiently capacious to cover nearly the whole floor of the place where they are collected; which is done by spreading some veal, placed in the middle of the bag, with oil of rhodium, and laying in the bag baits of proper food. This bag, which before laid flat, becomes gathered, with the mouth spread open, is to be suddenly closed when the rats are all in it. Others drive or frighten them, by flight noises or motions, into a bag of a long form, the mouth of which, after all the rats are come in, is drawn up to the opening of the place by which they entered, all other ways of retreat being secured. Others, again, intoxicate or poison them, by mixing with the repast prepared for them the cocculus indicus, or the nux vomica. A receipt for this purpose has appeared, which directs four ounces of cocculus indicus, with twelve ounces of oatmeal, and two ounces of treacle or honey, to be made up into a moist pate with strong beer: but if the nux vomica be used, a much less proportion will serve than is here given of the cocculus. Any similar composition of these drugs, with that kind of food the rats are most fond of, and which has a strong flavour, to hide that of the drugs, will equally well answer the end. If, indeed, the cocculus indicus be well powdered, and infused in strong beer for some time, at least, half the quantity here directed will serve as well as the quantity before mentioned. When the rats appear to be thoroughly intoxicated with the cocculus, or sick with the nux vomica, they may be taken with the hand, and put into a bag or cage, the door of the place being first drawn to, lest those which have strength and fكنfe remaining should escape. By these methods, when well conducted, a very considerable part of the rats in a farm, or other house, and the contiguous buildings, may be taken and destroyed. But various other methods have been practised.

In the Transactions of the Bath Agricultural Society, the following compositions are advised for destroying these mischiefive creatures, and which are stated to have been attended with great success. First, to a quart of oatmeal, add six drops of oil of rhodium, one grain of muffle, and two or three of the nuts of nux vomica finely powdered; make them into pellets, and put them into the rat-holes. This, it is said, was at first greedily eaten, and did great execution; but the wife animals, after a time, ceased to eat it. Secondly; this composed of three parts of oatmeal and one of flave's acre, mixed well into a pate with honey. Pieces of this pate were laid in their holes, and again did great execution. Thirdly; this is a method of destroying them by laying a large box down on its front side, with the lid supported open by a string over a pulley; and by trailing toadish cheese and a red-herring from their holes to this box, and placing oatmeal and other food in it, which they are for a few nights to be permitted to eat unmolested; and finally, to watch them by moon-light, the inside of the box being painted white; and, when many of them are seen, to let down the lid; by which contrivance sixty of them are stated to have been taken at one time. But though the usual ways of destroying rats are by traps and poison, Mr. Forlthy advises never to use arsenic, or corrosive sublimate, for that purpose, except under particular circumstances, as they are deadly poisons: nux vomica will, he thinks, generally answer the end as well, without the danger. He suggests it as a very good plan, to prevent accidents, to enchoice the traps in cafes, having holes in the ends of them large enough to admit rats, but small enough to exclude dogs, cats, &c. And that, as a bait for rat-traps, the following composition may be made use of with advantage. Take a pound of good flour, three ounces of treacle, and six drops of the oil of caraways: put them all in a dish; and rub them well together till they are properly mixed: then add a pound of crumb of bread. The traps baited with this mixture should be set as near their haunts as possible; but, for two or three days, so as not to fall or strike on the rats going in, but letting them have free liberty to go in and out at pleasure, as this makes them saucers. Some of the bait should also, he thinks, be laid at the rat-holes, and a little of it scattered quite up to the traps, and so on to the bridge of each trap, where a handful may be placed. It may also, he thinks, be proper to fasten the traps with the following mixture, for the purpose of enticing the rats into them. Take twenty drops of the oil of rhodium, five or seven grains of musk, and half an ounce of oil of aniseed; put them in a small phial, and shake it well before using; then dip a piece of twisted paper or rag in the mixture, and rub each end of the trap with it, if a box trap, and put two or three drops on the bridge, leaving the paper or rag in the trap. Of whatever kind the trap is, it should be scented; but once in a twelvemonth will be sufficient. Then throw some chaff mixed with a little wheat about the bottom of the trap, in order to deceive the rats; for they are very fagacious, and will not enter a suspicious place. This will be necessary to be done only at the first time of setting the traps; for, after some rats have been caught and have watered and dunged in them, rats will enter boldly when they find others have been there before them; do not, therefore, wash or clean out the trap, as some people do before they set it again, but let the dung and urine remain in it. Keep the places where the traps are set as private as possible; and when they are set for catching, mix no bread with the bait, as the rats will, in that case be apt, to carry it away.

And it is useful, this writer remarks, when the holes are found quiet, and that no rats use them, to fill them up with the following composition. Take a pint of common tar, half an ounce of pearl-ashes, an ounce of oil of vitriol, and a good handful of common salt, mix them all well together in an old pan or pot. Take some pieces of paper, and lay some of the above mixture very thick on them; then fill the holes well up with them, and build up the mouth of the holes with brick or stone, and mortar; if this be properly done, rats will, he affirms, no more approach these while either smell or taste remains in the composition.

But with a view to destroy rats in places where traps cannot be set, it is recommended to take a quart of the above bait, then to raft into it three nuts of nux vomica, and add a quarter of a pound of crumb of bread, if there was none before; mix them all well together, and lay it into the mouth of their holes, and in different places where they fre-quent; but first give them of the bait without nux vomica, for three or four succeeding nights; and when they find it agrees with them, they will eat that mixed with the nut with greedines.

However, as it is frequently found that rats are very troublesome in fews and drains, in such cafes arfenic may be used with success in the following manner. Take some dead rats, and having put some white arfenic, finely powdered, into an old pepper-box, shake a quantity of it

5 L. 2
on the fore-parts of the dead rats, and put them down the
holes, or avenues, by the sides of the fewers at which they
come in; this puts a stop to the live ones coming any further:
for when they perceive the arfenic, they will retire imme-
diately; whereas, if they were put down without the arfenic,
the live ones would eat them.

It is by means of arfenic, notwithstanding the above ob-
ervations, that the most certain method of deſtruying these
troubleſome vermin, (provided they can be made to eat it,) 
takes place; which we have found to anſwer best, when it is
prepared by being finely levigated, and mixed up with very
strong old cheefe and oatmeal.

In a note in the Agricultural Survey of Lancashire, it is
rated, that it is greatly to be lamented that Mr. Heath-
cote’s method of deſtruying rats and mice is not generally
known and practifed; if it were, there would be a total ex-
tirpation of those obnoxious and destructive animals; for in
one night he totally destroys them (where he is employed),
be they ever so numerous, as can be well attedled by hundreds
in the neighbourhood of Ormskirk, who have employed
him. And it is added, that the compofition he makes ufe
of he puts in their holes and burrows, and from the small
quantity he uſes, it is alſonſhing it ſhould have ſuch an eſfect:
it will keep good two years. It is alſo itated, that a farmer
recommends, for the deſtruction of rats, one ounce of pounded
quick-lime to four ounces of tallow cake, to be beaten toge-
ther and made into balls, and placed in their runs, which has
clearly many buildings. But it has been proved by expe-
tience, is it said, that an ounce of aerated barytes finely
powdered, mixed with the tallow, in place of lime, is more
effeſtual. And it has been remarked by the author of Phy-
tologia, with the view of deſtruying the water-rats, that
they poſsefs some kind of ingenuity ſimilar to the beaver in
the construction of their houses near the brinks of rivers and
pools; which have two apertures, one above ground
amongst the grafs, and the other beneath the ſurface of the
water; and unleſ they can hide their upper opening amid
weeds, or grafs, they forfaie the ſituation. Thus, if a
rim, three or four feet in breadth, round a fish-pond be kept
fo low as to rife onlty two, three, or four inches above the
level of the water; and if this be kept clean from high grafs
or weeds, the rats will defert the pond.

But after all, it is probable that this highly deſtructive
animal, and great peſt to the farmer, might be moſt readily
exterminated by parifhes uniting for the purpoſe, and rai-
ing certain fums of money to be applied in this way, under
the direcțion of a proper perfon who is fully acquainted with
the bufneſs.

In many grafs and other diſtricts in the kingdom these
animals prevail very much, efpecially the grey kind, parti-
cularly in all those where there are no regular railed fiadles
or iflands for the graſs to rye upon, which is the cafe in a
graſs in a great number. The miſchief, injury, and deſtruction
of graſs which is produced in this way, is ſcarcey to be cal-
culated; and they are besides very miſchievous, troubleſome,
and inconvenient in several others; so that they ſhould be ev-
ery where extirpated as much as poſsible. And in corn
traits, iflands or fiadles ſhould every where he provided in
order to prevent miſchief being done by them. See Ver-
min, and Stand, Corn.

Rat, Beaver. See Mus Coypus.
Rat, Black. See Mus Rattus.
Rat, Blind. See Mus Typhlus.
Rat, Field. See Mus Sybilicus.
Rat, Mole. See Mus.
Rat, Mountain. See Marmot Talpinus, &c.
Rat, Myna. See Mus Zikhius.
A gunner's quarter-gunners, seventy-four through left hwd; them all of the gunner's or Watch, in then and They.

RATAN, in Geography, a small island on the W. side of the gulf of Bothnia. N. lat. 63° 58'. E. long. 20° 39'.

RATCH, or RASH, in Clock Work, a sort of wheel having twelve fangs, which serve to lift up the detents every hour, to make the clock strike.

RATCHETS, in a Watch, are the small teeth at the bottom of the fusee, or barrel, which flop it in winding up.

RATCHIN LOGA, in Geography, a large lake of Thibet. N. lat. 35° 43'. E. long. 82° 27'.

RATCLIFF, a town of America, in Maryland; 22 miles S. of Salisbury.

RATE, a standard or proportion, by which either the quantity or value of a thing is adjusted.

The rates of bread, &c. in London, are fixed by authority. See AYliffe of Bread.

The rates of interest, as now established by law in England, is five per cent. The rate of interest in Italy, is three per cent.; in Sweden, six; in France, five; in Spain, ten; in Barbadoes, ten; in Ireland, twelve; in Turkey, twenty. Low rates of interest advance the prices of land.

The rates or fares of hackney-coachmen, chairmen, and watermen, are fixed by act of parliament. See Hackney Coaches, &c.

The rates of exchange, factorship, &c. are different. See Exchange, Factorage, &c.

Rate of a Ship of War, is its order, degree, or distinction, as to magnitude, burden, force, &c.

The British fleet is accordingly distributed into fix rates, exclusive of the inferior vessels that usually attend on naval armament; as sloops of war, armed ships, bomb-ketches, fire-ships, and cutters or schooners, commanded by lieutenants.

Ships of the first rate mount a hundred cannon, and some more, having forty-two-pounders on the lower deck, twenty-four-pounders on the middle deck, twelve-pounders on the upper deck, and fix-pounders on the quarter-deck and forecastle. They are manned with eight hundred and fifty men, including their officers, seamen, marines, and servants.

In general, the ships of every rate, besides the captain, have the master, the boatwain, the gunnner, the chaplain, the purser, the surgeon, and the carpenter; all of whom, except the chaplain, have their mates or assistants, in which are comprehended the fail-maker, the master at arms, the armourer, the captain's clerk, the gunsmith, &c. The number of other officers is always in proportion to the rate of the ship. Thus, a first rate has six lieutenants, fix master's mates, twenty-four midshipmen, and five surgeon's mates, who are considered as gentlemen; besides the following petty officers: quarter-masters, and their mates, fourteen; boatwain's mates, and yeomen, eight; gunnner's mates and assistants, fix; quarter-gunnerns, twenty-five; carpenter's mates, two, besides fourteen assistants; with one steward, and steward's mate to the purser.

Ships of the second rate carry ninety-eight and ninety

guns upon three decks; of which those on the lower battery are thirty-two-pounders; those on the middle, eighteen-pounders; on the upper deck, twelve-pounders; and those on the quarter-deck, fix-pounders, which usually amount to four or fix. Their complement of men is seven hundred and fifty, in which there are six lieutenants, four master's mates, twenty-four midshipmen, and four surgeon's mates, fourteen quarter-masters and their mates, eight boatwain's mates and yeomen, fix gannon's mates and yeomen, with twenty-two quarter-gunnerns, two carpenim's mates, with ten assistants, and one steward and steward's mate.

Ships of the third rate carry from sixty-four to eighty cannon, which are thirty-two, eighteen, and nine-pounders. The eighty-gun ships, however, begin to lose their repute, and give way to those of seventy-four, seventy, &c. which have only two whole batteries; whereas the former have three, with twenty-eight guns planted on each; the cannon of their upper deck being the same as those on the quarter-deck and forecastle of the latter, which are nine-pounders.

The complement in a seventy-four is fix hundred and fifty; and in a sixty-four, five hundred; having in peace, four lieutenants, but in war, five, and when an admiral is abroad, fix. They have three master's mates, sixteen midshipmen, three surgeon's mates, ten quarter-masters and their mates, six boatwain's mates and yeomen, four gannon's mates and yeomen, with eighteen quarter-gunnerns, one carpenter's mate with eight assistants, and one steward and steward's mate under the purser.

Ships of the fourth rate mount from sixty to seventy guns, upon two decks and the quarter-deck. The lower tier is composed of twenty-four-pounders; the upper tier, of twelve-pounders; and the cannon on the quarter-deck and forecastle are fix-pounders. The complement of a fifty-gun ship is three hundred and fifty men, in which there are three lieutenants, two master's mates, ten midshipmen, two surgeon's mates, eight quarter-masters and their mates, four boatwain's mates and yeomen, one gannon's mate and one yeoman, with twelve quarter-gunnerns, one carpenter's mate and fix assistants, and one steward and steward's mate.

All vessels of war under the fourth rate, are usually comprehended under the general name of frigates, and never appear in the line of battle. They are divided into the fifth and sixth rates, the former mounting from forty to thirty-two guns, and the latter from twenty-eight to twenty. The largest of the fifth rate have two decks of cannon, the lower battery being of eighteen-pounders, and that of the upper deck of nine-pounders; but those of thirty-fix and thirty-two guns have only one complete deck of guns, mounting twelve-pounders, besides the quarter-deck and forecastle, which carry fix-pounders. The complement of a ship of forty-four guns is two hundred and eighty men; that of a frigate of thirty-fix guns, two hundred and forty men. The first has three, and the second two lieutenants; and both have two master's mates, fix midshipmen, two surgeon's mates, fix quarter-masters and their mates, two boatwain's mates and one yeoman, one gannon's mate and one yeoman, with ten or eleven quarter-gunnerns, and one purser's steward.

Frigates of the sixth rate carry nine-pounders; those of twenty-eight guns having three-pounders on their quarter-deck, with two hundred men for their complement; and those of twenty-four, one hundred and fifty men; the frigate has two lieutenants; the latter, one; and both have two master's mates, four midshipmen, one surgeon's mate, four quarter-masters and their mates, one boatwain's mate and one yeoman, one gannon's mate and one yeoman, with six or seven quarter-gunnerns, and one purser's steward.

The
The flops of war carry from eighteen to eight cannon; the largest of which have fix-pounders; and the smallest, 8 in. those of eight or ten guns, four-pounders. Their officers are generally the same as in the sixth rates, with little variation; and their complements of men are from one hundred and twenty to sixty, in proportion to their force or magnitude.

Bomb-veils are on the same establishment as floops; but fire-ships and hospital-ships are on that of fifth rates. If the dimensions of all ships of the same rate were equal, it would be easy to collect them into one point of view in a table; but as there is no invariable rule for the general dimensions, we shall select those of fame of a late construction in each rate.

<table>
<thead>
<tr>
<th>Rate</th>
<th>Name</th>
<th>Length of the keel</th>
<th>Length of the lower deck</th>
<th>Depth in the hold</th>
<th>Burthen in tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Victory</td>
<td>216 ft. 15 in.</td>
<td>186 ft. 6 in.</td>
<td>51 10</td>
<td>21 9 162</td>
</tr>
<tr>
<td>2d</td>
<td>Barbeau</td>
<td>194 ft. 6 in.</td>
<td>177 ft. 6 in.</td>
<td>50 0</td>
<td>21 0 152</td>
</tr>
<tr>
<td>3d</td>
<td>Arrogant</td>
<td>188 ft.</td>
<td>168 ft. 3 in.</td>
<td>47 4</td>
<td>19 9 152</td>
</tr>
<tr>
<td>4th</td>
<td>Salisbury</td>
<td>160 ft.</td>
<td>159 ft. 3 in.</td>
<td>49 4</td>
<td>19 9 156</td>
</tr>
<tr>
<td>5th</td>
<td>Venus</td>
<td>146 ft. 3 in.</td>
<td>138 ft. 11 in.</td>
<td>40 9</td>
<td>17 4 144</td>
</tr>
<tr>
<td>6th</td>
<td>Carysfort</td>
<td>120 ft. 3 in.</td>
<td>110 ft. 11 in.</td>
<td>33 8</td>
<td>10 6 136</td>
</tr>
<tr>
<td>Sloop Nautilus</td>
<td>98 ft.</td>
<td>87 ft.</td>
<td>90 ft.</td>
<td>27 2</td>
<td>12 8 316</td>
</tr>
</tbody>
</table>

Ships of one hundred guns, and above, and downwards to sixty-four, are termed ships of the line.

Ships of the line, fifties, frigates, and royal yachts, are commanded by post-capitains; floops of war, bombas, fireships, armed ships, fire-ships, and armed en fluit, under fifty guns, by commanders; schooners, cutters, &c. by lieutenants; flagship-ships occasionally by masters; and small craft by midshipmen, who have passed for lieutenants.

Ships of the second rate, and those of the third, which have three decks, carry their sails remarkably well, and labour very little at sea. They are excellent in a general action, or in cannonading a fortres. Those of the third rate, which have two tiers, are fit for the line of battle, to lead the convoys and squadrons of ships of war in action; and, in general, to suit the different exigencies of the naval service. The fourth rates may be employed on the same occasions as the third rates; and may be also defined for service among the foreign colonies, or on expeditions of great distance; since these veils are usually excellent for keeping and maintaining the sea. Veils of the fifth rate are too weak to suffer the shock of a line of battle; but they may be defined to lead the convoys of merchant ships, to protect the commerce in the colonies, to cruise in different stations, to accompany squadrons, or be sent express with necessary intelligence and orders. The fame may be observed of the sixth rates.

The frigates which mount from twenty-eight to thirty-eight guns upon one deck, with the quarter-deck, are extremely proper for cruising against privateers, or for short expeditions, being light, long, and usually excellent sailors.

**RAT

**RATENSTADT,** in Geography, a town of Hindoostan, in Mysoor; 25 miles E. of Ratnagiri.

**RATEEN,** or **RATTEN,** in Commerce, a thick woolen stuff, quilted, woven on a loom with four treads, like fergins, and other stuffs that have the whole or quilling.

There are some rates drefled and prepared like cloths; others left finfly in the hair; and others where the hair, or knap, is frized.

Rateens are chiefly manufactured in France, Holland, and Italy; and mostly used in linings.

The frize is a fort of coarse rateen; and the drugget is a rateen half linen, half woolen.

**RATEIL,** in Zoology, a name given by the Hottentots to an animal inhabiting the Cape of Good Hope, which lives on honey, and is a great enemy to bees: hence called the Viverra Melivora; which see. It has a blunt black nose; no external ears, but a small rim round the orifice; a rough tongue, short legs, very long claws, which are straight like those of a badger, and guttered beneath; the colour of the forehead, crown, and whole upper part of the body, is a cinereous grey; the cheeks, and space round the ears, throat, breast, belly, and limbs, black; from each ear to the tail extends along the sides a dusky line, leaving beneath another of grey. Its length from the nose to the tail is forty inches, and the tail twelve.

This animal preys in the evening, and ascends to the highest parts of the desert to look about; and will then put one foot before its eyes, to prevent the dazzling of the sun. The reason of its going to an eminence is for the sake of hearing or observing the honey-guide cuckoo, or cuculus indicator, which lives on bees, and, as it were, conducts it to their haunts. Pennant.

**RATENSTADT,** in Geography, a town of Hungary; 16 miles S.E. of Baes.

**RATESPONDE de Mulher,** a town of Portugal, in the province of Entre Duero e Minho; 15 miles N.E. of Villa de Conde.

**RATH,** a word used in the composition of names of places in Ireland, as Rathdrum, &c. It signifies an intrenchment, or fort.

**RATH,** ripe, in Agriculture, a term applied to some early ripe corn crops, and which have a degree of rind on the straw; such as some varieties of barley, &c.

**RATHANGAN,** in Geography, a poft-town of the county of Kildare, Ireland, situated on the Athy branch of the Grand Canal; 28½ miles W. from Dublin, and 5 miles N.N.W. from Kildare.

**RATHCONRATH,** a small town of the county of Weithmarch, Ireland, which gives name to a barony. It is 44 miles N. by W. from Dublin, on the road to Lanefborough, and 6 miles W. from Mullingar.

**RATHCOOLE,** a small poft-town of the county of Dublin, Ireland, where fairs are held for cattle and pedlars' wares. It is on the great southern road, 7½ miles S.W. from Dublin.

**RATHCORMUCK,** a poft-town of the county of Cork, Ireland, which returned two members to the Irish parliament, before the union. It has gone much to decay, in consequence of the prosperity of Fermoy, which is little more than three miles distant. It is near the river Bride, 111 miles S.W. from Dublin, and 135 N.E. from Cork.

**RATHDOWNY,** a poft-town of the Queen's county, Ireland; 89 miles S.W. from Dublin.

**RATHDRUM,** a poft-town of the county of Wicklow, Ireland, situated on the river Owen. It has a monthly fair.
fair for flannels, of which there is a considerable manufacture. The adjoining country is very interesting, and the Wicklow copper-mines are not far distant. Rathdrum is 29 miles S. from Dublin.

RATHENAUN, or Ratemao, a town of the middle mark of Brandenburg, on the Havel; 38 miles W. of Berlin. N. lat. 52° 38'. E. long. 12° 32'.

RATHER, or Neather, a river of England, which runs into the Lune, four miles N. of Kirkby Lonsdale, in the county of Westmoreland.

RATHERIUS, in Biographia, a very learned prelate in the tenth century, commenced his ecclesiastical career by embracing a monastic life at the abbey of Lobbes, or Laubes, in Flanders. Here he distinguished himself by his abilities and acquirements. In the year 928, after Hilduin had been driven out of the see of Liege, he accompanied him into Italy; and in 931 he was, by the express order of the pope, put in possession of the see of Verona. As, however, this was in direct hostility to the king of the country, he was exposed to much persecution, and at length banished from Italy. After spending five years in exile, he returned with the hope of regaining his bishopric; but he was unsuccessful, and was ordered to withdraw. He obeyed, and retired into Provence; from this place he went to the abbey of Lobbes, where the recollection of the honour, which he had formerly reflected on that establishment, secured him a welcome reception. Shortly after this, he was sent for by the emperor Otto, who placed him near the perfon of his brother Bruno. This prince, having been made archbishop of Cologne in the year 953, presented Rathesius to the bishopric of Liege; from which, however, he was driven in about two years. As the emperor Otto was at this time in Italy, our prelate made an effort to recover his former see of Verona. Accordingly he laid his case before a synod assembled at Pavia, which passed a decree that he should be re-established in that bishopric. His peace was soon interrupted by controversy with the clergy, who could not endure his reproofs of their irregularities and corruptions; till at length they became so irksome to him, that he determined to take his final leave of Italy. He accordingly went to France, where he purchased some estates, and obtained the abbies of St. Amand, Aumont, and of Anay. He died at Nanter, about the year 973. His works are numerous, some of which are inserted in father d'Achery's "Spicilegum." They are said to afford evident proofs of great sagacity and judgment, while they breathe throughout an ardent love of virtue. They also shew, that he was not devoid of zeal and intrepidity in exposing the irregularities and vices of the times, and particularly the corrupt morals of ecclesiastics. Moreni. Molheim.

RATHFRILAND, in Geography, a poll-town of the county of Down, Ireland. It is situated on a rising ground, and has four great straight roads leading up to it, and centering in the town. It is on the road to Downpatrick, and much frequented. The neighbourhood abounds with granite of a close texture, and fit for building. On the summit of the hill are the ruins of a castle, formerly one of the residences of the Magunnes, lords Iveagh. Rathfriland is 57½ miles N. from Dublin, and 7½ miles N.E. from Newry.

RATHKEALE, a poll-town of Ireland, in the county of Limerick. It is situated on the river Deel, and was formerly a corporation town, and of much more consequence than at present. It has several fairs, one of which for horses is much frequented, as also its races. In the reign of queen Elizabeth, it sustained an attack of the English army. The ruins of a priory, founded by a perfon of the name of Harvey, are still remaining. Rathkeale is 108 miles S.W. from Dublin, and 14 miles W.S.W. from Limerick.

RATHLACKEN, a post-town of the county of Mayo, Ireland, on the sea-coast, not far from Rathlacken or Re-lakin head, and west of the entrance to Killala bay. It is 132 miles W.N.W. from Dublin, and 5 miles N. from Killala.

RATHLIN, Raghill, or Raghely, an island situated between the north coast of Antrim, in Ireland, and Scotland, and confidered as belonging to the former. It is about five miles in length, and three quarters of a mile in breadth, being bent in an angle towards the middle. This angle lies opposite to Ballycastle, and forms a tolerable bay, called Church bay; but in a westerly wind, though the anchorage is good, few vessels can ride it out, from the swell along the coast. The number of plantation acres is about 2000, which support a population of about 130 or 140 families, amounting to about 1100 persons. The cultivated land is kindly enough, and produces excellent barley. But kelp is the great source of wealth to this island, 100 tons of which have been exported from it in one year. The horses, as well as the sheep, are small, but serviceable; and the black cattle are not large, though they do well when brought to the main land, and better foil. The inhabitants are a little hot, licentious, and honest race of people, much attached to their own island, and regarding Ireland as a foreign country. The monuments of antiquity are small tumuli, in one of which, when opened, a stone coffin was found, beside which an earthen vessel was placed. Within the tumuli lay a considerable number of human bones, which might have been the remains of more ignoble men than the person whose remains the coffin covered. Brazen swords and spear-heads have also been found. The remains of a fortres are visible, where Robert Bruce is said to have defended himself for some time, when obliged to fly from his country. N. lat. 55° 20'. W. long. 6° 6'.

RATHMANSFORD, a town of Silezia, in the principality of Neisse; 4 miles N.N.W. of Weidenaus.

RATHOWEN, a poll-town of the county of Wexford, Ireland, near the borders of Longford; 48 miles W.N.W. from Dublin.

RATHSCHACH, or Radesche, a town of the duchy of Carniola, on the Save; 9 miles W.N.W. of Gurkfeld.

RATHSPRESENTGERS, in Commerce, silver coins of Aix-la-Chapelle, being double, single, or half pieces of 22, 16, and 8 marks. By the aysay, the rathspresentger is worse than the English standard of 11 oz. 2 dwt., by 4 oz. 2 dwt. Its weight is 4 dwt. 1½ gr.; its content in pure silver 56.9 grs.; and its value in sterling 8d. The double of the same is worse by 2 oz. 15 dwt.; its weight 6 dwt. 23½ grs.; its content in pure silver 116.3 grs.; and its value in sterling 1s. 43d. This coin bears on one side an eagle within a circle, marked 16 on his breast, (52 on the double piece), and within another circle the legend, REGNUM CURIA PRINCIPALIS PRIMA; and next the edge, URBS AQUENSIS. URBS REGALIS. REGNISEDIS; on the other side, or reverse, an altar, with two swords and a crown over it, on the double piece; but on the single, a crown and the date within a circle; the legend on both is LOCUS CESAREA CORONATIONIS; Caesar being a general title for the emperor. Kelly's Un. Cambit.

RATI, in Geography, a small island in the Grecian Archipelago, near the S. coast of Nicaria.

RATIBOR, a town of Silezia, in a principality of its name, on the Oder, which here becomes navigable; 70 miles
The principality is bounded N. by the principality of Oppeln, on the E. by Poland, on the S. by Telfchen, and on the W. by the principality of Jagendorf. Its soil is better than that of Oppeln, as it produces a sufficient supply of wheat, rye, and barley, with fruits; and besides, it has also good pasturage grounds. Its only river is the Oder, which passes through its western part; but it is abundantly watered in all its parts with streams, ponds, and lakes. It contains only three cities, and the inhabitants are universally Polish. It became a principality in 1288, and about 200 years afterward it was united to Oppeln, from which it has never been separated.

**RATIFICATION, Ratification**, an act, approving of, and confirming, something done by another, in our name.

A treaty of peace is never secure till the princes have ratified it.

All procuration imports a promise of ratifying and approving what is done by the proxy, or procurator: after treating with a procurator, agent, factor, &c. a ratification is frequently necessary on the part of his principal.

**Ratification** is particularly used, in our Law, for the confirmation of a clerk in a benefice, prebend, &c. formerly given him by the bishop, &c. where the right of patronage is doubted to be in the king.

Ratification is also used for an act confirming something we ourselves have done in our own name.

An execution, by a major, of an act passed in his minority, is equivalent to a ratification.

**RATING.** See Rating.

**RATINGEN, or Ratingen,** in Geography, a town of the duchy of Berg; 4 miles N.E. of Duffeldorp. N. lat. 51° 3'; E. long. 6° 47'.

**RATINO,** a town of Naples, in the county of Molife; 6 miles S.E. of Molife.

**RATIO, in Arithmetic and Geometry,** that relation of homogeneous things, which determines the quantity of one from the quantity of another, without the intervention of any third.

The homogeneous things, thus compared, we call the terms of the ratio; particularly that referred to the other, we call the antecedent; and that to which the other is referred, the consequent.

Thus, when we consider one quantity by comparing it with another, to see what magnitude it has in comparison of that other; the magnitude this quantity is found to have in comparison with it, is called the ratio of this quantity to that; which some think would be better expressed by the word comparison.

Euclid defines ratio by a mutual relation of two magnitudes of the same kind in respect of quantity. But this definition is found defective; there being other relations of magnitudes which are constant, yet are not included in the number of ratios: such as that of the right line, to the line of the complement in trigonometry.

Hobbes endeavoured to improve Euclid’s definition of ratio, but without success; for in defining it, as he does, by the relation of magnitude to magnitude, his definition has not only the same defect with Euclid’s, in not determining the particular kind of relation; but it has this farther, that it does not express the kind of magnitudes which may have a ratio to one another.

Ratio is frequently confounded, though very improperly, with proportion. Proportion, in effect, is an identity or similarity of two ratios.

Thus, if the quantity A be triple the quantity B; the relation of A to B, i.e. of 3 to 1, is called the ratio of A to B. If two other quantities, C, D, have the same ratio to one another that A and B have, i.e. be triple one another, this equality of ratio constitutes proportion; and the four quantities A : B :: C : D, are in proportion, or proportional to one another.

So that ratio exists between two terms; proportion requires more.

There is a twofold comparison of numbers: by the first, we find how much they differ, i.e. by how many units the antecedent exceeds, or comes short of, the consequent.

This difference is called the arithmetical ratio, or exponent of the arithmetical relation or habit of the two numbers. Thus, if 5 and 7 be compared, their arithmetical ratio is 2.

By the second comparison, we find how oft the antecedent contains, or is contained in, the consequent; i.e. as before, what part of the greater is equal to the less.

This ratio, being common to all quantity, may be called ratio in the general, or by way of eminence: but is usually called geometrical ratio; because expressed, in geometry, by a line, though it cannot be expressed by any number.

Modern authors distinguish ratio, with regard to quantity in the general, into rational and irrational.

**Ratio, Rational,** is that which is as one rational number to another; e.g. as 3 to 4.

**Ratio, Irrational,** is that which cannot be expressed by rational numbers.

Suppose, for an illustration, two quantities, A and B; and let A be less than B. If A be substracted as often as it can be from B, e. gr. five times, there will either be left nothing, or something. In the former case, A will be to B, as 1 to 5; that is, A is contained in B five times; or A = B. The ratio here, therefore, is rational.

In the latter case, either there is left a part, which being substracted certain times from A, e. gr. 3 times, and likewise from B, e. gr. 7 times, leaves nothing; or there is no such part: if the former, A will be to B as 3 to 7, or A = B; and therefore the ratio, rational. If the latter, the ratio of A to B, i.e. what part A is of B, cannot be expressed by rational numbers; nor any other way than by either lines, or by infinite approaching series.

The exponent of a geometrical ratio is the quotient arising from the division of the antecedent by the consequent. Thus, the exponent of the ratio of 3 to 2, is $\frac{3}{2}$; that of the ratio of 2 to 3, is $\frac{2}{3}$; for when the lesser term is the antecedent, the ratio, or rather the exponent, is a proper fraction. Hence the fraction $\frac{3}{2} = \frac{2}{3}$, and consequently the ratio is unity, the antecedent itself is the exponent of the ratio; thus, the exponent of 4 to 1, is 4. See EXponent.

If two quantities are compared, without the intervention of a third; either the one is equal to the other, or unequal: hence, the ratio is either of equality or inequality. If the terms of the ratio be unequal, either the less is referred to the greater, or the greater to the less: that is, either the less to the greater, as a part to the whole, or the greater to the less, as the whole to a part. The ratio, therefore, determines how often the less is contained in the greater, or how often the greater contains the less; i.e. to what part of the greater the less is equal.

The following differences of ratios are sometimes found in early authors.

The ratio which the greater term has to the less, e. gr. 6 to 3, is called the ratio of the greater inequality: the ratio which the less term has to the greater, e. gr. 3 to 6, is called the ratio of the lesser inequality.

This ratio corresponds to quantity in the general, or is admitted
admitted of by all kinds of quantities, discrete or continued, commensurable or incommensurable; but discrete quantity, or number, does likewise admit of another ratio.

If the lefs term of a ratio be an aliquot part of the greater, the ratio of the greater inequality is said to be multiplex, multiple, and the ratio of the lefs inequality, submultiplex.

Particularly, in the first cafe, if the exponent be 2, the ratio is called duplicate; if 3, triple, &c. In the second cafe, if the exponent be 4, the ratio is called subduplicate; if 5, subtriple, &c.

E. gr. if the exponent be 2, 3 is in a triple ratio; because 3 contains two thrice. On the contrary, 2 to 6 is a subtriple ratio; because 2 is the third part of 6.

If the greater term contains the lefs once, and over and above an aliquot part of the same; the ratio of the greater inequality is called superparticularis, and the ratio of the lefs subsuperparticularis.

Particularly, in the first cafe, if the exponent be 1, it is called fentence; if 2, subfentence, &c. In the other, if the exponent be 3, the ratio is called subfentence; if 4, subfubfentence, &c.

E. gr. 3 to 2 is in a fentence ratio; 2 to 3 in a subfentence.

If the greater term contains the lefs once, and over and above several aliquot parts; the ratio of the greater inequality is called superparticularis; that of the lefs inequality is subsuperparticularis.

Particularly, in the former cafe, if the exponent be 1, the ratio is called superparticularis tertius; if 2, superparticularis quartus; if 3, superquadruparticularis quintus, &c.

In the latter cafe, if the exponent be 3, the ratio is called subsuperparticularis tertius; if 4, subsuperparticularis quartus; if 5, subsuperquadruparticularis quintius, &c.

E. gr. the ratio of 3 to 2 is superparticularis tertius; that of 3 to 5, subsuperparticularis tertius.

If the greater term contains the lefs several times, and, besides, some quota part of the same; the ratio of the greater inequality is called multiplex, superparticularis; and the ratio of the lefs inequality, submultiplex, subsuperparticularis.

Particularly, in the former cafe, if the exponent be 2, the ratio is called dupla fentence; if 3, triplic i fentence, &c. In the latter cafe, if the exponent be 3, the ratio is called subdupla fentence; if 4, subtriplica fentence, &c.

E. gr. the ratio of 16 to 9 is triplica fentence; that of 4 to 9, subdupla fentence.

Lastly, if the greater term contains the lefs several times, and several aliquot parts of it besides; the ratio of the greater inequality is called multiplex, superparticularis; that of the lefs inequality, submultiplex, subsuperparticularis.

Particularly, in the former cafe, if the exponent be 2, the ratio is called dupla superparticularis tertius; if 3, triplic i superparticularis quartus, &c. In the latter cafe, if the exponent be 3, the ratio is called subdupla superparticularis tertius; if 4, subtriplica superparticularis quartus, &c.

E. gr. the ratio of 25 to 7 is triplica superparticularis quintus, that of 3 to 8, subdupla superparticularis tertius.

There are the various kinds of rational ratios; the names of which, though they occur but rarely among the modern writers (for in lieu of them they use the smallest terms of the ratios, e. gr. for duplicate 2:1, for fentence 3:2); yet are they absolutely necessary to such as converse with the ancient authors.

Clavius observes, that the exponents denote the ratios of the greater inequality, both in deed and name; but the ratios of the lefs inequality, only in deed, not in name: but it is easy finding the name in thefe, if you divide the denominator of the exponent by the numerator.

E. gr. if the exponent be 3, then 5:8 = 1:2; whence it appears, the ratio is called subsuperparticularis quintus. As to the names of irrational ratios, nobody ever attempted them.

Same, or identic ratios, are those whose antecedents have an equal respect to their confequents, i.e. whose antecedents divided by their confequents, give equal exponents. And hence may the identity of irrational ratios be conceived.

Hence, first, as oft as the antecedent of one ratio contains its confequent, or whatever part it contains of its confequent, fo oft, or fuch part of the other confequent does the antecedent of the other ratio contain: or, as oft as the antecedent of the one is contained in its confequent, fo oft is the antecedent of the other contained in its confequent.

Secondly, if A be to B as C to D; then will A : B :: C : D; or A : B = C : D. The former of which is the usual manner of representing the identity of ratios, the latter is that of the excellent Wolthus; which has the advantage of the former, in that the middle character, =, which denotes the fames, is fcientific; i.e. it expresses the relation of the thing represented, which the other, ::, does not. See Character.

Two equal ratios, e. gr. B : C = D : E, we have already observed, constitute a proportion: of two unequal ratios, e. gr. A : B and C : D, we call A : B the greater, if A : B > C : D; or the contrary, we call C : D the hiffer, if C : D > A : B.

Hence, we express a greater and lefs ratio thus: e. gr. 6 to 3 has a greater ratio than 5 to 4; for, 6 : 3 = (2) > 5 : 4 ( = 1 1/2). But 3 to 6 has a lefs ratio than 4 to 5; for = < 4 : 5. Compound ratio is that made up of two or more other ratios, which the fum of the antecedents of two or more ratios has to the fum of their confequents. Thus, 6 to 72 is in a ratio compounded of 2 to 6, and 3 to 12.

Particularly if it be compounded of two, it is called a duplicate ratio; if of three, a triplicate; if of four, quadruplicate; and, in the general, duplicate, if it be composed of several fimilar ratios. Thus 48 : 3 is a duplicate ratio of 4 : 1 and 12 : 3.

RATIO. Additive. See ADDITIVE.
RATIO. Alternate. See Alternate.
RATIO. Ordinate. See Ordinate.
RATIO Modularis and Modulari, were terms introduced into use by Cotes, but more modern authors do not use them always in the same fene: according to Cotes, the modulus in logarithms is that number which connects any fystem of logarithms with the hyperbolic fystem; or that number by which the hyperbolic number of a logarithm must be multiplied, or by the reciprocal of which it must be divided, in order to transform it to another fystem; and this modulus is, therefore, always the reciprocal of the hyperbolic loga- rithm of the radix of that fystem to which the modulus belongs.

This is what Cotes calls the modulus, to whom we owe the introduction of the term; and the reciprocal of it he calls the ratio modularis: but some modern authors, as Lagrange, &c. use the term modulus to denote the ratio modularis of Cotes.

The modulus of the hyperbolic fystem is 1, this being the reciprocal of the hyperbolic logarithm of 2.71828182, the radix of this fystem; and the modulus of the common logarithm
logarithmic system is \( \log_{2} 2 \), which is the reciprocal of the hyperbolic logarithm of \( \log_{2} 2 \), the radix of this system.

It is shown under the article Logarithms, that

\[
\log_{a} \frac{a}{b} = \frac{1}{2} \left( \frac{a - b}{b} \right)^{2} + \frac{1}{2} \left( \frac{a - b}{a} \right)^{2}, \ldots
\]

where \( r \) is the radix, and may be assumed at pleasure, and the reciprocal of this whole denominator is called the modulus. In the hyperbolic system the whole denominator is assumed \( 1 \), which makes \( r = 2 \), and the common system \( r \) is assumed 10, and the whole series becomes \( \log_{10} \frac{a}{b} = \frac{1}{2} \left( \frac{a - b}{b} \right)^{2} + \frac{1}{2} \left( \frac{a - b}{a} \right)^{2}, \ldots \)

where whatever be the value of \( r \); therefore, in every system, the modulus is the reciprocal of hyp. log. of the radix. See Logarithms.

Ratio, Denominator of \( a \). See Denominator.

Ratio, Properties of \( 1 \). Ratios similar to the same third are also similar to one another; and those similar to the same, are also similar to one another.

2. \( a : b :: c : d \); then, inversely, \( b : a :: d : c \).

3. Similar parts \( p \) and \( q \) have the same ratio to the wholes \( T \) and \( t \); and if the wholes have the same ratio, the parts are similar.

4. If \( a : b :: c : d \); then, alternately, \( a : c :: b : d \).

And hence, if \( b = d \), \( a = c \); and hence, also, if \( a : b :: c : d \); and \( a : f :: c : g \); we shall have \( b : f :: d : g \). Hence, again, if \( a : b :: c : d \); and \( f : a :: g : c \); we shall have \( f : b :: d : g \).

5. Those things which have the same ratio to the same, or equal things, are equal; and vice versa.

6. If you multiply any quantities, as \( A \) and \( B \), by the squares of \( A \) and \( B \), the products \( D \) and \( E \) will be to each other as \( A \) and \( B \).

7. If you divide any quantities, as \( A \) and \( B \), by the squares of \( A \) and \( B \), the quotients \( F \) and \( G \) will be to each other as \( A \) and \( B \).

8. The exponent of a compound ratio is equal to the sum of the exponents of the simple ratios.

9. If you divide the antecedents of the consequents of similar ratios, \( A : B \), and \( C : D \), by the same \( E \); in the former case, the quotients \( F \) and \( G \) will have the same ratio to the consequent \( B \) and \( D \); and in the latter, the antecedents \( A \) and \( B \) will have the same ratio to the quotients \( H \) and \( K \).

10. If there be several quantities in the same continued ratio \( A, B, C, D, E, \ldots \); the first \( A \) is to the third \( C \), in a duplicate ratio; to the fourth \( D \), in a triplicate; to the fifth \( E \), in a quadruplicate, &c. ratio of the ratio of the first \( A \), to the second \( B \).

11. If there be any series of quantities in the same ratio, \( A, B, C, D, E, \ldots \); the ratio of the first \( A \) to the last \( F \) compounded of the intermediate ratios \( A : B :: B : C :: C : D :: D : E :: E : F \), &c.

12. Ratios compounded of ratios, of which each is equal to each other, are equal among themselves. Thus the ratios \( \frac{3}{4} : \frac{3}{4} :: \frac{3}{4} : \frac{3}{4} \), compounded of \( 3 : 3 :: 4 : 4 \), and \( 3 : 3 :: 4 : 4 \) and \( 3 : 1 :: 20 : 4 \).

For other properties of similar or equal ratios, see Proportion.

Ratios, Reduction of. It is obvious that there is a variety of cases in which the real ratio of two quantities may be expressed in terms too great to be applied to any useful purpose; of which we have an example in the construction of planetariums, and similar astronomical instruments. The ratios of the times in which the several planets perform their sidereal revolutions, are expressed in very large numbers, far exceeding the number of teeth that can be introduced into the machinery of a planetarium; and it, therefore, becomes necessary to find smaller numbers, which, though they do not express the true ratio, may approximate as near to the truth as the scale of the clock will admit. Another instance, in which a reduction of the ratio of large numbers to others expressed in lower terms becomes necessary, occurs in the calendar; for, according to the common reckoning, the year is supposed to be 365 days, whereas it is known to be nearly 365 days 6 hours; it, therefore, becomes necessary to have some means of expressing the ratio between the true and the assumed length of the years, in order that, by a proper interpolation, we may preserve an uniformity in the feast days, with reference to the month, as we should otherwise find the short day transferred to the middle of June, and the long day to the month of December.

This reduction of ratios is best performed by means of continued fractions, of which a sketch is given under that article, as also under the article Indeterminate Analysis, but which we shall probably treat at greater length in a supplement to the present work, on which account it is not our intention to enter much into the rationale of the theory in this place, but merely to state the rules by which the required reduction is to be performed.

To reduce a ratio expressed as a fraction, to others nearly equivalent, but represented in simpler terms.

Rule 1. Divide the greater of the two numbers by the less; then the divisor by the remainder, and so on, as in finding the greatest common measure of two numbers, and refer the several quotients, which may be denoted by \( a, b, c, d, \&c. \).

2. Write down the several quotients, thus; \( a, b, c, d, \&c. \) from which the series of converging fractions or ratios will be derived as follows; viz. the first fraction will have unity for its numerator, and the first quotient, \( a \), for its denominator; the second will have the second term, \( b \), for its numerator, and for its denominator \( a + b + 1 \); and the numerators of all the succeeding fractions will be found, by multiplying the numerator last obtained, by the succeeding quotient in the above series, and adding to the product the preceding numerator, and the denominators are obtained by precisely the same rule, merely changing the word numerator into denominator.

In this rule we have supposed the ratio to be less than 1, or the numerator less than the denominator; if the denominator be less than the numerator, it must be reversed, making the numerator what we have called the denominator, and the denominator the numerator.

The last fraction of this series will be the same as the original fraction proposed, and the others will be as many approximate or converging fractions, each of which will approach nearer to the original fraction than the preceding one, and nearer than any other fraction whose terms are not expressed by greater numbers. This rule may be exhibited analytically as follows:

Let \( \frac{A}{B} \) be the proposed fraction, and \( a, b, c, \&c. \) the quotients obtained by the divisions as above, then the converging
verging fractions will be
\[
\frac{bc + 1}{a} \frac{b}{ab + 1} \frac{bc + 1}{(ab + 1)c + a} \frac{(ab + 1)c + a}{d + ab + 1},
\]
&c. which will be found to agree with the preceding rule; and these fractions will be alternately greater and less than that proposed, which will be the limit of the series.

Let us illustrate this rule by an example. Required a series of converging fractions towards \( \frac{314159}{100000} \), which is the fraction commonly employed for expressing the ratio of the diameter to the circumference of a circle.

**Operation by Division.**

\[
\begin{array}{c}
100000 \div 314159 = 3 \quad a \\
300000 \div 314159 = 9 \quad b \\
92613 \div 314159 = 3 \quad c \\
28797 \div 314159 = 1 \quad d \\
854 \div 314159 = 33 \quad e \\
825 \div 33 = 29 \quad f \\
29 \div 4 = 7 \quad g \\
4 \div 1 = 4 \quad h
\end{array}
\]

Having thus obtained our quotients, the several fractions will be easily formed by the preceding rule; thus,

\[
\begin{array}{c}
3 & 7 & 15 & 25 & 1 & 7 & 4 \\
\frac{3}{7} & \frac{22}{15} & \frac{335}{25} & \frac{3355}{15} & \frac{33555}{7} & \frac{9208}{4} & \frac{92089}{1} \\
\frac{7}{15} & \frac{3044}{25} & \frac{3044}{15} & \frac{3044}{7} & \frac{9563}{4} & \frac{9563}{1} \\
\frac{15}{25} & \frac{276149}{1} & 106' & 3044 & 106' & 3044 & 106'
\end{array}
\]

the last of which is the same as the original fraction. These fractions are formed according to the preceding rule, which will be understood from one example; thus, the fifth fraction is formed from the two preceding fractions as follows:

\[
335 \times 25 + 335 = 9208 \
113 \times 25 + 106 = 2931
\]

the numerator and denominator of the last fraction add, once, twice, three times, &c. the numerator and denominator of the principal fraction which interpolates between the two, which will form the interpolated fractions required. Thus, because \( \frac{76149}{24239} \) is the principal fraction interpolated between \( \frac{9563}{3044} \) and \( \frac{314159}{100000} \), the intermediate or interpolated fraction will be

\[
\begin{array}{c}
9563 & + 76149 = 85712 \\
3044 & + 24239 = 27283 \\
9563 & + 2 \times 76149 = 161861 \\
3044 & + 2 \times 24239 = 51522 \\
2963 & + 3 \times 76149 = 238010 \\
3044 & + 3 \times 24239 = 75761
\end{array}
\]

And
And in the same manner we may interpolate fourteen fractions between \( \frac{3}{1} \) and \( \frac{333}{106} \); twenty-four between \( \frac{333}{106} \) and \( \frac{9208}{2931} \); and six between \( \frac{9208}{2931} \) and \( \frac{16149}{24339} \).

Having thus explained the nature of the operation, we shall enter into detail in the following example.

Example 2.—According to M de la Caille, the solar year is \( 365\frac{\text{d}}{4} \) and \( 48 \text{m} 49\text{s} \), and consequently longer by \( 48 \text{m} 49\text{s} \) than the common year of 365 days. If this difference were exactly 6 hours, it would make one day at the end of four common years; but if we wish to know exactly at the end of how many years this difference will produce a certain number of days, we must seek the ratio between \( 24\text{b} \) and \( 5\text{h} \), which we find to be \( \frac{20929}{86400} \).

As that at the end of 86400 common years, we must intercalate 20929 days, in order to reduce them to tropical years.

Now as the ratio of 86400 to 20929 is expressed in very high terms, let it be required to find ratios in lower terms, as near this as possible.

For this purpose, we must perform upon these numbers the same operations as in the preceding case; thus:

\[
\begin{align*}
20929 \times 86400 &= 4a \\
2684 \\
\frac{2684}{2931} \times 20929 &= 7b \\
18768 \\
\frac{2141}{2931} \times 2684 &= 1c \\
2141 \\
\frac{543}{2931} \times 2141 &= 3d \\
1629 \\
\frac{512}{2931} \times 543 &= 1e \\
512 \\
\frac{31}{2931} \times 512 &= 16f \\
496 \\
\frac{16}{2931} \times 31 &= 1g \\
16 \\
\frac{15}{2931} \times 16 &= 1b \\
15 \\
\frac{1}{2931} \times 15 &= 1c \\
15 \\
\end{align*}
\]

From which quotients we derive the following converging fractions, \( \text{viz.} \)

\[
\begin{array}{cccccccc}
4 & 7 & 1 & 3 & 1 & 16 & 1 & 1 \\
4 & 29 & 33 & 128 & 161 & 2704 & 2865 & 5569 & 86400 \\
1 & 7 & 8 & 31 & 39 & 655 & 694 & 1349 & 20929 \\
\end{array}
\]

It appears farther, that as the fractions \( \frac{4}{1}, \frac{29}{7}, \frac{33}{8}, \text{&c.} \) are alternately less and greater than the fraction \( \frac{86400}{20929} \), or \( \frac{24\text{b}}{5\text{h} \text{48m} 49\text{s}} \), the intercalation of 1 day in 4 years would be too much of 7 days in 29 years, too little, of 8 days in 33 years too much again, and so on; but each of these intercalations will be the most exact, that it is possible to make in the same space of time.

Now if we arrange in two separate series, the fractions that are less, and those that are greater, than the given fractions, we may infert or interpolate between certain of these fractions, as in the preceding examples.

Taking first those fractions that are less than the given one, and their corresponding quotients, we shall have,

\[
\begin{array}{cccccccc}
1 & 1 & 15 & 4 & 33 & 2865 & 86400 \\
1 & 8 & 694 & 20929 \\
\end{array}
\]

Hence it appears, that the only interpolation that can be performed is between the two fractions \( \frac{2865}{86400} \) and \( \frac{694}{20929} \), which will admit of 14 intermediate fractions; which being supplied, as in the former example, gives the following series of converging fractions, each less than the fraction originally proposed, \( \text{viz.} \)

\[
\begin{array}{cccccccc}
4 & 33 & 161 & 2865 & 8434 & 14003 \\
1 & 8 & 39 & 694 & 2043 & 3392 \\
19572 & 25141 & 30710 & 36279 \\
4741 & 6090 & 7439 & 8788 \\
41848 & 52986 & 58555 & 64124 \\
10137 & 12835 & 14184 & 15533 \\
66633 & 75262 & 80831 & 86400 \\
16882 & 18231 & 19580 & 20929 \\
\end{array}
\]

And as the last fraction is the same as the given fraction, it is evident that this series cannot be carried farther: hence, if we choose to admit those interpolations only in which the error is too much, the simplest and most exact will be that of 1 day in 4 years, or of 8 days in 33 years, or of 39 in 161 years, and so on.

Let us now consider the decreasing fractions:

\[
\begin{array}{cccccccc}
7 & 3 & 16 & 1 \\
29 & 128 & 2704 & 5569 \\
7 & 31 & 655 & 1349 \\
\end{array}
\]

Here it appears, that we may place 6 fractions before the first, 2 between the first and second, 15 between the second and third; but between the third and fourth no such fraction can be inserted.

These interpolations being made, we shall have the following series of decreasing fractions, \( \text{viz.} \)

\[
\begin{array}{cccccccc}
5 & 9 & 13 & 17 & 21 & 25 \\
1 & 2 & 3 & 4 & 5 & 6 \\
29 & 62 & 95 & 128 & 289 & 450 \\
7 & 15 & 23 & 31 & 70 & 109 \\
611 & 772 & 933 & 1094 & 1255 \\
143 & 187 & 226 & 265 & 304 \\
\end{array}
\]
which are all less than the proposed fraction, and expressed in less terms; and each of which is nearer than any other fraction that can be expressed in less terms.

Hence we conclude, that if we only attend to the intercalations in which the error is too small, the simplest and most exact are those of 1 day in 5 years, of 2 days in 9 years, of 3 days in 13 years, of 4 days in 17 years, and so on.

In the Gregorian calendar, only 97 days are intercalated in 400 years; but it is evident, from the preceding table, that it would be much more exact to intercalate 109 days in 450 years.

But it must be observed, that in the Gregorian reformation, the determination of the year given by Copernicus was made use of, which is 355'44° 20'"; and substituting this instead of the fraction we shall have 86400 over 29029, or rather 540; whence we may find, by the preceding method, the quotients 4, 8, 5, 3; and from them the principal fractions

\[
\frac{4}{1}, \frac{33}{8}, \frac{169}{41}, \frac{540}{131},
\]

which, except the two first, are quite different from those before determined. However, we do not find amongst these fractions 400, which is that adopted in the Gregorian calendar; and this fraction cannot even be found among the interpolated fractions, which might be inserted in the two series, \(\frac{3}{4}, \frac{169}{41}, \frac{33}{8}, \frac{540}{131}\); for it is evident that it could only be between the last two fractions, between which, because of the number 3 (the corresponding quotient), there can be but two fractions interpolated, which are \(\frac{202}{49}, \frac{371}{90}\); whence it appears, that it would have been more exact, if, in the Gregorian reformation, they had only intercalated 90 days in the space of 371 years.

If we reduce the fraction \(\frac{400}{37}\), so as to have for its numerator the number 86400, it will become \(\frac{86400}{29052}\), which estimates the tropical year at 365'25° 49'12".

In this case, the Gregorian intercalation would be quite exact; but as observations shew that the year is shorter than this by more than 20', it is evident that, at the end of a certain period of time, we must introduce a new intercalation.

If we adopt the determination of de la Caille, it follows, as the denominator 97 of the above fraction, viz. \(\frac{400}{97}\), lies between the denominators of the fifth and sixth principal fractions already found, that, from what has been stated above, the fraction \(\frac{161}{39}\) will be nearer the truth than 400. But as astronomers are still divided with regard to the exact length of the year, we shall refrain from giving a decisive opinion on this subject. For more on the reduction of ratios, see Lagrange's Additions to Euler's Elements of Algebra.
ratio.

federation of ratios which have limits is difficult, we shall begin with examples of other quantities.

1st. Let there be formed a series, whose first term is 1; second, \( \frac{1}{2} \); third, \( \frac{3}{4} \); fourth, \( \frac{1}{2} \); and so on; every term being half the preceding one, viz.

\[
1, \quad \frac{1}{2}, \quad \frac{1}{4}, \quad \frac{1}{8}, \quad \frac{1}{16}, \quad \frac{1}{32}, \quad \&c.
\]

and let the sum of an indefinite number of terms in this series be considered as continually increased by the ascension of a new term; thus, the sum of the two first is \( \frac{3}{2} \), of three terms is \( \frac{15}{16} \), of four terms is \( \frac{1}{16} \), \&c.

I say then, that the varying sum of the terms of this series continually approaches to the fixed number 2, as its limit. For the difference between 1, 2, 3, \&c. terms, and the number 2, will be the numbers 1, \( \frac{1}{2} \), \( \frac{1}{4} \), \( \frac{1}{8} \), \( \frac{1}{16} \), \&c. successively, in infinitum. Here it is evident, that the terms in this last series, which express the successive differences between the increasing sum of the former series and the number 2, are all continually decreasing; and secondly, no term in this series of differences can become either nothing or negative; and thirdly, we may continue this series of successive differences, till we arrive at a term which shall be a less part of the fixed number 2, than any fractional part of it that can be assigned; or so that this difference shall be less, when compared with the number 2, than any ratio assigned. The number 2, therefore, having the conditions laid down in the definition, is to be called the limit of the sum of the terms of the infinite series 1, \( \frac{1}{2} \), \( \frac{1}{4} \), \( \frac{1}{8} \), \( \frac{1}{16} \), \&c.

And the same is to be understood of any other infinite series; viz. if a number can be found having the above conditions, that series is said to have a limit; and the finding of this limit, is what is to be understood when mathematicians speak of finding the sum of such an infinite series.

No number less than 2, for instance \( \frac{1}{2} \), can be taken for the limit; for, in this case, it will not answer the second condition of the definition. In the above example, the sum of four terms of the series is equal to 1\( \frac{1}{2} \), and the sum of five terms exceeds it; therefore, the difference between this sum and the number 1\( \frac{1}{2} \) proposed as a limit, is, in the former case zero, and in the latter negative. Neither can any number greater than 2, as for example 3, be taken for the limit, because here the last condition will be wanting; for if the sum of any assigned number of terms be less than 2, that sum must always want more than unity of the number 2, and consequently cannot approach nearer to 3, than any assigned quantity, as \( \frac{1}{2} \).

In like manner the sum of the series 1, \( \frac{1}{3} \), \( \frac{1}{9} \), \( \frac{1}{27} \), \&c. continued in infinitum, will be \( \frac{1}{2} \); the series of successive differences being \( \frac{1}{2} \), \( \frac{1}{6} \), \( \frac{1}{18} \), \( \frac{1}{54} \), \&c. in infinitum.

Now, in order to make the preceding example general, let \( \frac{a}{b} \) express the common ratio of any series of numbers in continual proportion, whose first term is unity; I say then, if \( \frac{a}{b} \) be greater than \( \frac{1}{2} \), such a series will have for its limit the quantity \( \frac{a}{a-b} \); or, in other words, the sum of all the terms of such an infinite series will be \( \frac{a}{a-b} \).

For the terms of this series will be \( \frac{1}{a}, \frac{b}{a}, \frac{b^2}{a}, \frac{b^3}{a}, \&c. \)

Whence the sum of 1 term is \( \frac{b}{a} \)

of 2 terms \( \frac{a+b}{a} \)

of 3 terms \( \frac{a^2+ab+b^2}{a^2} \)

of 4 terms \( \frac{a^3+a^2b+ab^2+b^3}{a^3} \)

Let each of these sums be subtracted from the limit \( \frac{a}{a-b} \) and we have the successive differences \( \frac{b}{a-b}, \frac{b^2}{a-b}, \frac{b^3}{a-b}, \&c. \) or if \( n \) be any assigned number of terms, the difference between the sum of that number of terms and the limit \( \frac{a}{a-b} \) will be \( \frac{b}{a-b} \cdot \frac{b^{n-1}}{a^{n-1}} \). Whence we may observe, 1st, that as the number of terms whose sum is required increases, this difference continually decreases, because \( \frac{b}{a-b} \), being a fraction less than unity, its powers continually decrease, 2dly. This difference can never become nothing or negative; the powers of a fraction, though they decrease, being always real and affirmative. 3dly. This difference may become less in respect of \( \frac{a}{a-b} \), than by any assigned ratio.

For \( \frac{a}{a-b} = \frac{b^a}{b^a}, \) \( \frac{b^a}{b^a} \), \( \frac{b^a}{b^a} \), or as \( \frac{a^n}{b^n} \) to 1; or as \( \left( \frac{a}{b} \right)^n \) to 1: and since \( \frac{a}{b} \) is greater than 1, and \( n \) indeterminate, the former term of the ratio may become greater than any assigned quantity, and therefore the ratio itself less than any ratio assigned.

The quantity \( \frac{a}{a-b} \), having, therefore, the required conditions, is the limit of the above series, or is equal to the sum of all the terms continued in infinitum.

What has been proved above may be shewn more concisely by dividing \( a \) by \( a-b \), in the manner of division in algebra, for the quotients will be the very series proposed in the example; for instance, \( \frac{a}{a-b} = (1 + \frac{b}{a} + \frac{b^2}{a^2} + \frac{b^3}{a^3} + \&c. \)

\[ \frac{b}{b-b} \]

\[ \frac{b^2}{b^2} \]

\[ \frac{b^3}{b^3} \]

\[ \frac{b^4}{b^4} \]

\[ \frac{b^5}{b^5} \]

\[ \frac{b^6}{b^6} \]

And
And it may be further confirmed by multiplying the proposed series by \( a - b \), for the product will be \( \alpha \), all the terms except the first destroyed each other.

We may also observe, that if every term of the foregoing series be multiplied by any number \( c \), it will become \( \frac{bc}{a} + \frac{b^2c}{a^2} + \frac{b^3c}{a^3} + \cdots \); a series having the same ratio, but whose first term is \( c \); and it is therefore evident, that, in this case, to find the sum of all the terms, we must multiply the former limit by \( c \), whence it will become \( \frac{ac}{a - b} \).

Before we begin to consider ratios, it may not be amiss to caution the reader against confounding the terms of a ratio with the ratio itself: the terms of a ratio may vary in some cases through all degrees of magnitude, and yet the ratio remain constant or invariable. In other instances, varying the terms in infinitum, likewise varies the ratio in infinitum; while in others, though varying the terms may also vary the ratio, yet the last ratio can never exceed certain limits.

Let \( x \) be any varying quantity; make \( 4x^2 + 3x = A \), and \( 2x^3 + x = B \), then will \( A \) and \( B \) also be varying quantities, as depending upon \( x \); when \( x \) vanishes, and \( A \) and \( B \) will both vanish; when \( x \) is infinite, they will be both infinite. I say then the ratio of \( A \) to \( B \), while \( x \) decreases in infinitum, approaches to the ratio of \( 3 \) to \( 1 \).

For, first, \( A \) is to \( B \), as \( 4x^2 + 3x \) is to \( 2x^3 + x \), or as \( 4x + 3 \) to \( 2x + 1 \); where it is obvious, that as \( x \) decreases, the quantities \( 4x + 3 \) and \( 2x + 1 \) also decrease, and consequently the ratio of \( 4x + 3 \) to \( 2x + 1 \), or of \( A \) to \( B \), approaches to that of \( 3 \) to \( 1 \). Secondly, the ratio of \( A \) to \( B \) can never exceed \( 3 \) to \( 1 \). For the ratio of \( 4x^2 + 3x \) to \( 2x^3 + x \), is \( 3 \) to \( 1 \); but \( 4x^2 + 3x \) becomes a less quantity than \( 6x^2 + 3x \), therefore \( 4x^2 + 3x \) is to \( 2x^3 + x \) as \( 2x^2 + 3x \) to \( 2x^3 + x \); that is, less than the ratio of \( 3 \) to \( 1 \).

Lastly, the ratio of \( A \) to \( B \) will approach nearer to the ratio of \( 3 \) to \( 1 \), than any assigned difference. For in the terms of this ratio, \( 4x + 3 \) to \( 2x + 1 \), the varying parts \( 4x \) and \( 2x \), by diminishing \( x \), may become less than any assigned quantity, while the other parts, \( 3 \) and \( 1 \), remain the same; therefore the ratio of \( A \) to \( B \) will approach nearer to the ratio of \( 3 \) to \( 1 \), than by any assigned difference.

In like manner the ratio of \( A \) to \( B \), while \( x \) increases in infinitum, approaches to the ratio of \( 2 \) to \( 1 \), as its limit.

For since \( A \) is to \( B \) as \( 4x + 3 \) to \( 2x + 1 \), or as \( 4x + 3 \) to \( 2x + 1 \), it is obvious that, as \( x \) increases, the quantities \( \frac{3}{x} \) and \( \frac{1}{x} \) decrease, and consequently the ratio of \( 4x + 3 \) to \( 2x + 1 \), or of \( A \) to \( B \), approaches to the ratio of \( 4 \) to \( 2 \), or of \( 2 \) to \( 1 \). For \( 4x^2 + 2x \) is to \( 2x^3 + x \), as \( 2 \) to \( 1 \); but \( 4x + 3x \), is a greater quantity than \( 4x + 2x \), therefore \( 4x + 3x \) is to \( 2x + x \); or \( A \) to \( B \) always in a greater ratio than \( 2 \) to \( 1 \). Lastly, the ratio of \( A \) to \( B \) will approach nearer to that of \( 2 \) to \( 1 \), than any assigned difference. For in the terms of this ratio, \( 4 \) and \( \frac{3}{x} \) and \( 2 \) and \( \frac{1}{x} \), the variable parts \( \frac{3}{x} \) and \( \frac{1}{x} \), by increasing \( x \), may become less than any assigned fraction, while the parts \( 4 \) and \( 2 \) remain the same; therefore the ratio of \( A \) to \( B \) will approach nearer to the ratio of \( 4 \) to \( 2 \), or \( 2 \) to \( 1 \), than any assigned difference.

Hence then we see that though diminishing \( x \), and consequently diminishing the terms \( A \) and \( B \), we increase their ratio, and on the contrary increasing these terms, by increasing the quantity \( x \), we decrease their ratio, yet there is a limit both to the increase and decrease of this ratio, although there be none to the terms themselves which compose it.

The ratio of \( 3 \) to \( 1 \), which limits the ratio of \( A \) to \( B \), when these terms decrease in infinitum, is called the ultimate ratio of the evanecent quantities \( A \) and \( B \). The ratio of \( 2 \) to \( 1 \), which is their other limit, is called the ultimate ratio of the quantities \( A \) and \( B \) increasing in infinitum.

Another example of a similar kind we have as follows.

Let \( x \) be a varying quantity, and \( d \) a constant one, then will \( x + d \) and \( x \) be two varying quantities capable of all degrees of magnitude, I say that the ratio of \( x + d \) to \( x \), while \( x \) increases, will continually decrease, but not beyond a certain limit, which is the limit of equality. On the contrary, if \( x \) decreases, the ratio of \( x + d \) to \( x \) continually decrease more and more ad infinitum, and never come to a limit. For \( x + d \) is to \( x \), as \( 1 + \frac{d}{x} \) to \( 1 \); now as \( x \) increases, the fraction \( \frac{d}{x} \) decreases, and may become less than any assigned fraction; but the number \( 1 \), which is the other part of the antecedent of this ratio, remains the same, as does likewise the consequent, therefore the ratio of \( 1 + \frac{d}{x} \) to \( 1 \), continually approximates to a ratio of equality. Secondly, it can never reach that ratio, because \( \frac{d}{x} \) has always some magnitude, and consequently \( 1 + \frac{d}{x} \) always greater than \( 1 \). It therefore can never reach the ratio of equality, and much less can it pass it, so as to become a ratio minoris inaequalitatis, or a ratio in which the antecedent is less than the consequent. Lastly, the varying fraction \( \frac{d}{x} \), as \( x \) increases, will become less than any assigned fraction, while the other part of the antecedent, and likewise the consequent of this ratio, remain the same.

Therefore the ratio of \( 1 + \frac{d}{x} \) to \( 1 \), will approach nearer to the ratio of equality, than by any ratio that can be assigned, however small such ratio may be; therefore the ratio of equality is the limit of the ratio of \( 1 + \frac{d}{x} \) to \( 1 \), and consequently the limit of the ratio of \( x + d \) to \( x \), which continually decreases, while the terms which compose this ratio continually increase in infinitum.

If \( x \) decrease then \( \frac{d}{x} \) will increase, and may become greater than any assigned number, while the other part of the antecedent, and likewise the consequent, remain invariable; therefore the ratio of \( 1 + \frac{d}{x} \) to \( 1 \), and consequently the ratio of \( x + d \) to \( x \), as \( x \) decreases, will become greater than any assigned ratio whatever, having no limit to its increase.
We may further observe, that though the terms of this ratio, viz. \( x + d \) to \( x \), never approximate nearer to each other, their constant difference being \( d \), yet the ratio of the terms approximates to the ratio of equality; that is, though the terms get no nearer in their difference, yet, if we may be allowed the expression, they get nearer in their ratio. The difference of the terms, and the ratio of the terms, are ideas very distinct from each other, and in no wise to be so connected, but that one may vary whilst the other is constant. Although the ratio of equality may strictly be called the limit of the varying ratio of the quantities \( x + d \) and \( x \), yet the terms of this ratio can never be strictly said to be equal, nor ultimately equal, as that supposes an ultimate rate in which they are equal; nor equal when they \( \text{vanish into infinity} \), or, when they pass out of finite into infinity. There is no finite quantity next to infinity, no number, for instance, which is the next number to infinity. Nor is there any step from a rate of nothing into finite existence; there is no fraction so small as to be the very next fraction to nothing; no fraction can be aligned so small, but another fraction may be aligned that is smaller. Neither can we say, in strictness, that two infinitely great numbers with a finite difference are equal, it being a proposition obviously absurd and contradictory. There is no such thing in nature as an infinitely great number; and it is contradictory to say of any two numbers, both that they have a difference, and that they are equal. Whoever considers that the idea of infinity is a general or abstract idea, that the idea of number is always particular, that infinity is a property of numbers, a property of extension, &c. itself, will readily perceive that these and such like expressions have no literal meaning. (See Locke, b. ii. ch. 16. and ch. 17.) As to the metaphorical use of them, to avoid circumlocution, or the introduction of new terms, it may be allowed, when once the literal meaning has been explained, in this, as well as on various other occasions both in science and in common life.

When the difference between any two quantities decreases, so as to become a less fractional part of the one of them than any aligned fractional part whatever; or when the difference between the terms of a ratio becomes less in respect of one of them (the greater for example) than any aligned ratio, this may be expressed by saying, that such difference \( \text{vanishes} \) in respect of that greater quantity.

But if the difference between two terms vanishes in respect to one of them, it will also vanishes in respect of the other. It is true that at any aligned time, when the terms have a particular magnitude, the difference between the terms will always be a less fractional part of the greater term than it is of the lesser term; but as this difference continually decreases, it will become the same fractional part of the lesser term that it was before the greater, however small that fractional part of the greater term may be; therefore, if the difference vanishes with regard to one of them, it will vanish all with regard to the other. We may, therefore, instead of the third condition of our definition, say, that “the difference must vanish in respect of either of the fixed or of the varying quantity, since one of these implies the other.”

The above is true as well for the case of two variables, as for one fixed and one variable, though both of such variables increase or decrease without limit. Thus, in the example above given, in which the terms were \( x + d \) and \( x \), and where \( x \) is continually increasing, the terms themselves both continually increase; for in this instance it is obvious, that if the difference vanishes with respect to one of the terms, it will also vanish with respect to the other. Let \( x \) be to \( d \), at any aligned point of time, as \( n \) is to \( 1 \), and \( d \) at that instant of time will be the \( \frac{1}{n+1} \)th part of the greater term, and the \( \frac{n}{n+1} \)th part of the less term: now, though the contemporary \( n \) value of these fractions can never be equal, yet in succession the value of the latter fraction will become whatever the former has been; therefore, if \( \frac{1}{n+1} \) become less than any aligned fraction, so will \( \frac{n}{n+1} \) likewise; and thus, if the difference vanishes with respect to one of the terms, \( x + d \), so will it also vanish with respect of the other, \( x \). And the fame would be true if the terms were \( x \) and \( x - d \), all things else being as before.

Again, if \( x \) by decreasing vanish with respect to some fixed quantity \( n \), then will \( x \), multiplied by a given number \( n \), or \( nx \), vanish in respect of \( a \); or, which is the same, if \( x \) vanish in respect of \( a \), to likewise will the quantity \( nx \); bearing to \( x \) the assigned ratio of \( n \) to 1. For though at any particular point of time \( x \) is a smaller fractional part of \( a \) then \( nx \), yet \( x \) can be no aligned fractional part of \( a \) whatever; but by farther diminishing \( x \), the quantity \( nx \) may become the same fractional part of \( a \) that \( x \) was before. If, then, \( x \) may become equal to, or less than, any aligned fractional part of \( a \), to likewise may \( nx \); that is, if \( x \) vanish in respect of \( a \), to likewise will \( nx \).

For a like reason, if \( x \) vanish in respect of any quantity, it will likewise vanish in respect to that quantity multiplied or divided by any number; or it will vanish in respect of a quantity, bearing to any aligned ratio, as that of \( m \) to 1. Thus, if \( x \) vanish in respect of \( a \), it will also vanish in respect of \( 3a \), or \( 2a \), or \( 2a \), &c. or, if any fraction vanish in respect to the diameter of a circle, it will likewise vanish in respect of the radius. For whatever part of the diameter the line \( x \) may be at any aligned point of time, let \( x \) farther decrease, till it be half what it was at that aligned time, and it will now be the same part of the radius that it was before of the diameter; and the same with various other lines and quantities. We have shewn, in the preceding part of this article, that the ratio which two quantities bear to each other may have a limit, although the terms themselves may increase or decrease perpetually without limit. 1. If the terms approximate towards each other; 2, if the less never passes the greater; and, lastly, if their difference vanish in respect of either term, then the limit of their varying ratio is that of equality; and this, whether the terms themselves are such, as by increasing they both become greater than any aligned quantity, or, which is more common, such as by decreasing become less than any aligned quantity, or as it is called, \( \text{infinitely small} \). Because the idea of the terms of a ratio is less abstruse than that of the ratio itself, it is more usual to say that the terms themselves in this case are ultimately equal, though, strictly, it is the ratio only of the terms that comes to a limit, for the terms themselves are supposed to inerface or decrease without limit, or as we commonly say, \( \text{ad infinitum} \).

Prop.—In a circle whose centre is \( C \), (Plate XIII. Analytis, fig. 9.) radius \( CA \), diameter \( Aa \), let \( AB \) be the chord, \( BF \) the line, and \( AD \) the tangent of the arc \( AB \). I say, that while the arc \( AB \) continually decreases without limit; if, the line \( BF \) ultimately approaches the tangent; 2dly, the line never exceeds the tangent; 3dly, their difference will vanish in respect of either line or tangent.

First; \( BF : DA :: CF : CA \), but while the arc decreases, \( CF \) approaches to \( CA \); \( BF \) approaches to \( DA \).
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D A 2dly. C F can never exceed C A; therefore B F can never exceed D A. 3dly. The arc continually decreasing without limit, vanishes in respect of the diameter, which is fixed; therefore the chord A B, which is less than the arc, likewise vanishes in respect of the diameter A a.

But A a : A B :: A B : A F; therefore, if A B vanishes in respect of A a, A F will vanish in respect of A B; and much more will A F vanish in respect of A a; but if A F vanish in respect of A a, it will also vanish in respect of \( \frac{1}{2} A a \) or C A.

Now C A : C F :: A D : F B, and by division of proportion C A : A F :: A D : A D - F B. Therefore, as A F vanishes in respect of C A, so does A D - F B (the difference of the fine and tangent) vanishes in respect to A D the tangent, and consequently in respect of F B the fine. Whence we see, that while the arc continually decreases without limit, the fine approaches to the tangent; 2dly, the fine never exceeds the tangent; 3dly, although the fine and tangent both vanish in respect of the radius, yet their difference vanishes in respect of these quantities themselves. Therefore the ratio of equality is the limit of the varying ratio which the fine and tangent have to each other, while they both decrease perpetually without limit, or it is their ultimate ratio, or, as we may say, they are ultimately equal.

The fine is less than the chord; for in the right-angled triangle A F B, the side B F is less than the hypothenuse A B; the chord is less than the arc; this is self-evident, the chord being a straight line, and the arc a curve, both terminated by the same points A and B. The arc is less than the tangent; for from the point D draw another tangent to the circle in H; and the lines A B H, A D H, will be terminated by the same points A and H; and will have the concavities turned the same way; therefore the included arc A B H will be less than the sum of the two equal tangents D A and D H; consequently half that arc, or A B, will be less than half the sum of the tangents A D.

Cor. 1. Hence the fine, chord, arc, and tangent, are all ultimately in a ratio of equality. This may appear because the chord and arc are included between the fine and tangent, but perhaps more plainly thus. Of these four quantities, viz. the fine, chord, arc, and tangent, the fine is the least, and the tangent the greatest; therefore, the difference between the fine and the tangent is greater than the difference between any other two of these four quantities. If, therefore, the greatest of all those differences vanish in respect of the least of all those quantities, much more will the difference between any other two of these four quantities vanish in respect of the quantities themselves.

Cor. 2. Join B a, and in the right-angled triangle B F a, the hypothenuse B a is greater than the side F a; therefore A a - B a is less than A a - F a, or than A F; but while the arc A B decreases continually without limit, A F vanishes in respect of A a; much more then does A a - B a, the difference A a and B a, vanish in respect of A a; therefore the ultimate ratio of A a to B a is that of equality; and the ultimate ratio of \( \frac{1}{2} A a \) or B C to B a, is that of 2 to 1. See other applications of these principles in Leland's "Rudiments of Mathematics," from which the preceding article has been abstracted; Newton's "Principia," ib. 1; Smith's "Fluxions;" and Saundersen's "Algebra."

RATIO, in our Law Writers, is used for a judgment given in a cause.

Hence, *ponere ad rationem* is to cite one to appear in judgment. Walsingham, 88.

RATIO Status, Ragione di Stato. See REASON of State. Vol. XXIX.

**RAT**

Ratio Viátus. See VICTUS.

RATIOCINATION, the act of reasoning.

RATION, or RATIN, in the Army, a pittance or proportion of ammunition, bread, drink, or forage, distributed to each soldier for his daily subsistence.

Some write the word ration, and borrow it from the Spanish ratio; but they both come from the Latin ratio. In some parts they call it a rogan.

The horse have rations of hay and oats, when they cannot go out to forrage. See FORRAGE.

The rations of bread are regulated by weight. The ordinary ration of a foot soldier is a pound and a half of bread per day. The officers have several rations, according to their quality, and the number of attendants that they are obliged to keep.

When the ration is augmented on occasions of rejoicing, it is called a double ration.

The ships' crews have also their rations or allowances of biscuit, water, &c. proportioned according to their flocks. The usual ration at sea, particularly among the Portuguese, &c. is a pound and half of biscuit, a pint of wine, and a quart of fresh water per day; and each month an arrobe, or thirty-one pounds of salt meat, with some dried fish and onions.

RATIONABLES EXPENSE, Reasonable Expenses. The commons in parliament, as well as the proctors of the clergy in convocation, were anciently allowed rationables expensas; that is, such allowance as the king, considering the prices of all things, shall judge meet to impose on the people to pay for the subsistence of their representatives.

This in the 15th of Edward II. was settled at ten groats per day for knights, and five for burgesses; afterwards, four shillings a day for knights, and two shillings for burgesses; which was then deemed an ample retribution, both for expenses, for labour, attendance, neglect of their own affairs, &c. See BURGESS, and KNIGHTS OF THE SHIRE.

RATIONABILIS Parte Bonusum, a writ which lies for the wife, against the executors of her husband, denying her the third part of her husband's goods, after debts and funeral expenses paid.

Fitzherbert quotes Magna Charta, and Glanville, to prove, that by the common law of England, the goods of the deceased, his debts first paid, should be divided into three parts; of which his wife is to have one, his children a fecound, and the executors a third: adding, that this writ lies as well for the children, &c. as the wife. Such is the general law of Scotland at this day. And whatever may have been the custom of late years, in many parts of the kingdom, or however it was introduced in derogation of the old common law, the ancient method continued in use in the province of York, the principality of Wales, and the city of London, till very modern times; when in order to favour the power of bequeathing, and to reduce the whole kingdom to the same standard, three statutes have been provided; the one 4 & 5 W. & M. c. 2, explained by 2 & 3 Ann. c. 5, for the province of York; another, 7 & 8 W. III. c. 38, for Wales; and a third, 11 Geo. I. c. 18, for London (see CUSTOM of London); whereby it is enacted, that persons within those districts, and liable to those customs, may, if they think proper, dispose of all their personal estate by will; and the claims of the widow, children, and other relations, to the contrary, are totally barred. Thus is the old common law now utterly abolished throughout all the kingdom of England, and a man may devile the whole of his chattels as freely as he formerly could his third part or moiety. Blackft. Com. b. ii.

Recto de Rationabili Parte. See Recto.

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RATIONABILIBUS Divisio, is a writ that lies where two lords have forgeries joining together, for him that finds his waltie encroached upon, within the memory of man, against the encroacher, thereby to rectify the bounds of the forgeries; in which respect, Fitzherbert says, it is of the nature of a writ of right.

RATIONABILIS Dos, a third part of such lands and tenements as the husband was seized of at the time of the espousals, with which his wife was formerly endowed by the common law, if no specific donation was made at the church-porch. See Dower and Jointure.

RATIONAL, Reasonable. See Reason.

Rational Fables. See Fables.

Rational Fractions, in Arithmetic and Analysis, are those fractions into which no furd or radical quantity enters; as

\[ \frac{m}{a} \]

The decomposition of rational fractions into simple fractions, that is, the decomposition of them into other fractions whose sum is equal to that proposed, is an important problem, as connected with the integral calculus, and inverse method of fluxions, which was first investigated by Leibnitz, but has since been much extended and simplified by the researches of Euler, La Grange, La Croix, and other eminent analysts.

The decomposition of numeral fractions into their partial fractions, is, perhaps, rather a subject of curiosity than utility, yet as connected with, and leading to, the decomposition of rational algebraic fractions, it may not be amiss to give here a sketch of the processes by which it is accomplished, previous to entering upon the latter subject.

On the decomposition of rational numeral fractions, into others having prime denominators.

It is to be observed, that this can only be effected in the case of a composite denominator, or rather, there will be no difficulty in any other case, as it will require only a separation of the numerator into any parts at pleasure, the sum of which is obviously equal to the fraction proposed; we shall therefore only consider those fractions having composite denominators, which are to be resolved into others having prime denominators; and in this case there may be fractions that will not admit of decomposition, as will appear from what follows. This decomposition is effected, when possible, by means of the indeterminate analysis; viz. let \( \frac{m}{a} \) be the given fraction, and suppose, in the first instance, that its denominator consists of two prime factors, or \( a = ab \), it will then be to find \( \frac{m}{ab} = \frac{a}{a} + \frac{b}{b} \), or \( aq + bq = m \); and \( p \) and \( q \) being the required numerators of the two partial fractions, and which values of \( p \) and \( q \) are easily found from the above equation \( aq + bq = m \), on the principles explained under the article Indeterminate Analysis, subject however to the same limitation there mentioned; viz. the above equation is always possible, provided \( m > ab - a - b \), but in other cases it may or may not admit of solution.

If the given fraction be \( \frac{m}{ab} \), then we may first resolve it into two fractions, and one of these into two others; thus, let \( \frac{m}{ab} = \frac{a}{a} + \frac{b}{b} \), then we have \( abq + c = m \), from which equation \( p \) and \( q \) may be found.

Again, let \( \frac{p}{ab} = \frac{r}{a} + \frac{s}{b} \), which gives \( as + rb = p \), whence \( r \) and \( s \) may be determined, and we shall thus obtain

\[
\frac{m}{ab} = \frac{p}{a} + \frac{q}{b}
\]

as required. In all these cases it is obvious, that the fraction may be decomposed into partial fractions, in as many different ways as the indeterminate equation on which it depends admits of different answers.

Example.—Find two fractions, having prime denominators, whose sum shall be equal to \( \frac{19}{35} \), or to \( \frac{19}{35} \).

Let the required fractions be \( \frac{p}{7} + \frac{q}{5} \), then \( \frac{5p + 7q}{35} = 19 \); therefore \( 5p + 7q = 19 \), whence \( p = 1 \), and \( q = 2 \) (see Indeterminate Analysis); and consequently the required partial fractions are \( \frac{1}{7} \) and \( \frac{2}{5} \).

Example 2.—Find three fractions, whose sum is equal to \( \frac{401}{315} \).

The three factors of 315 are 5, 7, 9, which are of necessity the denominators of the required fractions. Suppose then first, that \( \frac{401}{315} = \frac{p}{5} + \frac{q}{7} + \frac{r}{9} \); whence we have \( 9p + 7q + 5r = 401 \), which gives \( p = 29 \), and \( r = 4 \); therefore \( \frac{401}{315} = \frac{29}{5} + \frac{4}{7} + \frac{r}{9} \). Again, let \( \frac{29}{5} = \frac{r}{r} \), or \( 5r + 7s = 29 \); this gives \( r = 3 \) and \( s = 2 \); so that \( \frac{29}{5} = \frac{3}{7} + \frac{2}{9} + \frac{r}{r} \), and consequently \( \frac{401}{315} = \frac{2}{5} + \frac{3}{9} + \frac{r}{r} \), as required. And in the same manner the decomposition may be obtained in any other case, when falls within the limits above stated.

On the decomposition of rational algebraic fractions, and its application to the integral calculus.

Let \( N = \frac{a + bx + cx^2 + dx^3 + \cdots + px^{n-1}}{D} \) be any rational fraction, whose decomposition into simple fractions is required, and whose numerator is at least one degree lower than its denominator, to which form it may always be reduced by division, if it should present itself under a different form.

The denominator of this fraction, from the known theory of equations, may be supposed to be made up of as many simple factors as is equal to the highest power of \( x \) contained in it, and which factors may be found by determining the roots of the equation formed by putting the whole denominator equal to zero. Let therefore \( a + bx + cx^2 + dx^3 + \cdots + px^{n-1} + qx^n \) be any rational fraction, whose decomposition into simple fractions is required, and whose numerator is at least one degree lower than its denominator, to which form it may always be reduced by division, if it should present itself under a different form.

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And therefore our proposed fraction \( \frac{N}{D} \) may now be put under the form

\[
\frac{N}{D} = \frac{a + bx + cx^2 + dx^3 + \cdots + px^{n-1}}{(x - r)(x - r')(x - r''(x - r^m))}
\]

and these factors are now to form the denominators of

\[
\frac{N}{D} = \frac{a + bx + cx^2 + dx^3 + \cdots + px^{n-1}}{(x - r)(x - r')(x - r''(x - r^m))}
\]
the simple fractions sought. Let \( A, A', A'', A''', \&c. \)
represent their numerators, so that
\[
\frac{N}{D} = \frac{A}{x-r} + \frac{A'}{x-r'} + \frac{A''}{x-r''} + \&c. \frac{A^{(n-1)}}{x-r^{(n-1)}}
\]

Reduce now these several simple fractions to a common denominator by the usual rule, and add their several numerators together; then comparing the co-efficients of the like powers of \( x \) in the numerator of this new fraction, with those in the numerator proposed, we shall obtain sufficient equations for determining the proper values of \( A, A', A'', A''', \&c. \)
and the decomposition will be effected as proposed. This will be better understood from a partial example.

Let us therefore assume the fraction
\[
\frac{6x^2 - 4x - 6}{x^3 - 6x^2 + 11x - 6},
\]
which it is required to resolve into its simple fractions.

Here the roots of the denominator, by making it equal to zero, are 1, 2, and 3, whence the proposed equation may be put under the form
\[
x^3 - 6x^2 + 11x - 6 = (x-1)(x-2)(x+3) = x^3 - x - 2 + (x+3),
\]

Make now this fraction
\[
\frac{6x^2 - 4x - 6}{(x-1)(x-2)(x+3)} = \frac{A}{x-1} + \frac{A'}{x-2} + \frac{A''}{x+3},
\]

which being reduced to a common denominator, and added together, give
\[
\frac{6x^2 - 4x - 6}{x^3 - 6x^2 + 11x - 6} = \frac{A(x-1)(x+3) + A'(x-1)(x+3) + A''(x-1)(x-2)}{(x-1)(x-2)(x+3)}
\]

\[
= \frac{(A + A' + A'')(x^2 - x - 2 + 3x)}{(x-1)(x-2)(x+3)}
\]
whence
\[
A + A' + A'' = 6
\]
\[
6A + 3A' - 2A'' = 6
\]

from which we readily draw \( A = 1, A' = 2, A'' = 3 \); so that the required fractions are
\[
\frac{1}{x-1} + \frac{2}{x-2} + \frac{3}{x+3}
\]

If therefore the fluent of \( \frac{6x^2 - 4x - 6}{x^3 - 6x^2 + 11x - 6} \) were required, we might immediately reduce the problem to finding the fluents of \( \frac{x}{x-1} + \frac{2x}{x-2} + \frac{3x}{x+3} \), which are known, being hyp. log. \( x \rightarrow 1 \) hyp. log. \( x \rightarrow 2 \) hyp. log. \( x \rightarrow 3 \) = hyp. log. \( [(x-1)(x-2)(x+3)] \)

The same method may be employed for all rational fractions, whose denominators are reducible into unequal simple factors, but as this cannot be generally effected when the highest power of the variable quantity exceeds the fourth degree, we are necessarily limited in our application of the rule, in consequence of the imprecision which still attends the general solution of equations. In the case, however, of equal factors in the denominator, a different process is required, which we will explain, after illustrating the above rule by two or three examples.

Required the fluent of \( \frac{(1+x)x}{x-x^3} \) by resolving it into
its simple fractions.

Here the factors of the denominator being \( x \) and \( 1-x \), we make
\[
\frac{(1+x)x}{x-x^3} = \frac{A}{x} + \frac{A'}{1-x} = \left(\frac{A + (A - A)x}{x-x^3}\right) \frac{x}{1-x},
\]

whence \( A = 1 \), and \( A' = 1 \), or \( A' = 2 \), therefore
\[
\text{fluent} \left(\frac{1+x}{x-x^3}\right) + \text{fluent} \left(\frac{A}{x}\right) + \text{fluent} \left(\frac{2x}{1-x}\right)
\]

which are known.

Required the fluent of \( \frac{(x-1)x}{x + 4x + 2x^2} \), or of \( \frac{1}{x-1} \).

Here, by making \( x^2 - 2x + \frac{1}{2} = 0 \), we have \( x = 1 \pm \frac{1}{2} \sqrt{2} \); make therefore,
\[
\frac{(x-1)x}{x - 1 - \frac{1}{2} \sqrt{2}} = \frac{A}{x-1} + \frac{A'}{x-1 + \frac{1}{2} \sqrt{2}}
\]

\[
\frac{1}{x - 1 - \frac{1}{2} \sqrt{2}} = \frac{A}{x-1} + \frac{A'}{x-1 + \frac{1}{2} \sqrt{2}}
\]

Here we have \( A + A' = - \frac{1}{2} \left( 1 - \frac{1}{2} \sqrt{2} \right) A + (1 + \frac{1}{2} \sqrt{2}) A' = - \frac{1}{2} \) whence we have \( A = - \frac{1}{2} \), and \( A' = - \frac{3}{2} \), therefore fluent of \( \frac{(x-1)x}{x-x^3} \) = fluent \( \frac{1}{x-1} \), which leads us to no useful result.

In case of equal factors, therefore, we must proceed as follows: let the proposed fraction be
\[
\frac{a + bx + cx + dx^2 + \cdots q x^{m-1}}{(x-p)^n (x-r)^n (x-s)^n} \quad \&c.
\]

Assume it equal to
\[
\frac{A}{x-r} + \frac{A'}{x-r'} + \frac{A''}{x-r''} + \cdots \frac{B^{n-1}}{x-p} + \frac{A}{x-r} + \frac{A'}{x-r'} + \frac{A''}{x-r''} + \&c.
\]

Where the upper line represents the fractions due to the \( n \) equal factors, and the lower those due to the \( m \) unequal factors.

Let now these fractions be reduced to a common denominator, and the co-efficients equated as before, which will give us the required values of the several numerators sought.

Example.—It is required to convert \( \frac{1 - 5x}{(1 + x) (1 + x)^4} \) into its equivalent simple fractions.

Assume \( \frac{1 - 5x}{(1 + x)^4} = \frac{B}{(1 + x)^3} + \frac{B'}{(1 + x)^2} + \frac{A}{(1 + x)^1} \)

\[
= \frac{B + (1 + x)B'}{(1 + x)^3} + \frac{A}{1 + x} = \frac{B + B' + A + (2 A - B)x + (A - B)x^3}{(1 + x)^3 (1 - x)}
\]

whence
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whence \[ B + B' + A = 1 \]
\[ 2A - B = -5 \]
\[ A - B' = 0 \]

therefore \[ B = 3, B' = -1, \text{ and } A = -1, \]
consequently
\[
\frac{1 - 5x}{(1 + x)^2 (1 - x)} = \frac{3}{1 + x} - \frac{1}{1 + x} - \frac{1}{1 + x} - \frac{1}{1 + x}.
\]

We have in both the preceding cases extended the calculation to a greater length than it is necessary to observe in practical cases, in order that the reader may see distinctly the principles on the decomposition depends. We shall now furnish him with an easier practical method, which we have extracted from Bonyycastle's Algebra, vol. i.

1. When the factors of the denominator of the given fraction are all unequal, or of the form

\[
\frac{N}{D} = \frac{A}{x - r}, \frac{A'}{x - r'} + \frac{A''}{x - r''} + \frac{A'''}{x - r'''}, \ldots
\]
note that which constitutes the denominator of the simple fraction which is to be found, and let \( S \) denote the product of all the remaining fractions; then if the root or value of \( x \), in that factor, be substituted for \( x \) in the formula \( S \), it will give the numerator of the fraction required.

2. If some of the factors are equal and others unequal, or of the form

\[
\frac{N}{D} = \frac{A}{x - r}, \frac{A'}{x - r'} + \frac{B}{x - p} \frac{B'}{x - p'}, \ldots
\]
let \( S \) denote the product of all the factors in the denominator, except one, as before ; then find the simple fractions due to the unequal fractions as above, and for those of the equal factors proceed as follows:

1. \[ B = \frac{N}{S}, \text{ taking } x \text{ in } N, \text{ and } S = p. \]

Let \[ Q = \frac{N - BS}{S}, \text{ then } \]

2. \[ B' = \frac{Q}{S}, \text{ taking } x \text{ in } Q, \text{ and } S = p. \]

Let \[ Q' = \frac{Q - B'S}{S}, \text{ then } \]

3. \[ B'' = \frac{Q'}{S}, \text{ taking } x \text{ in } Q', \text{ and } S = p. \]

Let \[ Q'' = \frac{Q' - B''S}{S}, \text{ then } \]

4. \[ B''' = \frac{Q''}{S}, \text{ taking } x \text{ in } Q'', \text{ and } S = p. \]

\&c.

Which operation being performed, the sum of the fractions thus obtained, together with the former, will give all the simple fractions into which the given fraction is resolvable.

Example 1.—It is required to convert the rational fraction \( \frac{1 + x^3}{x - x^3} \) into its equivalent simple fractions.

Here \( \frac{1 + x^3}{x - x^3} = \frac{A}{0 + x} + \frac{A'}{1 - x} + \frac{A''}{1 + x}; \) whence, by the preceding rule,

\[
\frac{A}{S} = \frac{1 + x^3}{x - x^3} = 1; \text{ being } a = x
\]

\[
A' = \frac{N}{S} = \frac{1 + x^3}{x + x^3} = 1; \text{ being } 1 = x
\]

\[
A'' = \frac{N}{S} = \frac{1 + x^3}{x - x^3} = -1; \text{ being } 1 = -x.
\]

The required fractions are therefore

\[
\frac{1}{x} + \frac{1}{1 - x} - \frac{1}{1 + x} = \frac{1 + x^3}{x - x^3}
\]

Example 2.—It is required to convert the rational fraction \( \frac{1}{x^3 (1 - x)} \) into its equivalent simple fractions. Here

\[
\frac{N}{D} = \frac{1}{x^3 (1 - x)} = \frac{A}{x - r} + \frac{B}{x - r'} + \frac{C}{x - r''} + \frac{C'}{x - r'''}, \text{ &c. }
\]

whence for \( 1 + x \), the first factor, we have

\[
A = \frac{N}{S} = \frac{1}{x^3 - 2x^3 + x^3} = \frac{1}{4}, \text{ for } 1 + x = 1
\]

\[
B = \frac{N}{S} = \frac{1}{1 - x - x^3 + x^3} = 1, \text{ for } 1 + x = 0.
\]

Let now \( Q = \frac{N - BS}{S}, \) for \( 1 + x = 2 \)

\[
Q' = \frac{Q}{S}, \text{ for } 1 + x = 0.\]

Again, for \( 1 - x \)

\[
C = \frac{N}{S} = \frac{1}{x^3 + x^3} = \frac{1}{2}, \text{ for } 1 - x = 1
\]

Let now \( R = \frac{N - CS}{S}, \) for \( 1 - x = 2 \)

\[
R' = \frac{R}{S}, \text{ for } 1 - x = 0.
\]

Therefore

\[
\frac{1}{x^3 (1 - x)^3 (1 + x)} = \frac{1}{x^3 + 1 + x} + \frac{1}{x^3 + x^3} + \frac{1}{x^3 + 2x^3} + \frac{1}{x^3 + 3x^3} = \frac{1}{x^3 + 1} + \frac{1}{x^3 + x^3} + \frac{1}{x^3 + 2x^3} + \frac{1}{x^3 + 3x^3} = \frac{1}{x^3 + 1} + \frac{1}{x^3 + x^3} + \frac{1}{x^3 + 2x^3} + \frac{1}{x^3 + 3x^3}, \text{ as required.}
\]

It is obvious, as we have before stated, that this decomposition of rational fractions must necessarily be affected as to its general application, by the imperfection of the theory of equations, which will not admit of a practical resolution of the denominator into its simple factors in all cases. It will also further appear, that, in case of any of the roots being imaginary, the same will necessarily enter into the numerators of the simple fractions. But this difficulty may be avoided : for since the imaginary roots of equations always enter in pairs, and the product of such pairs of roots being always real, being of the form \( x + 2 \alpha x + \alpha^2 + \beta \), we may, instead of resolving the fractions into simple fractions

\[
\frac{A}{x - r} + \frac{A'}{x - r'} + \frac{A''}{x - r''}, \text{ &c. }
\]

resolve it into as many of these fractions as it has rational simple factors, and into as many fractions of the form \( \frac{Bx + C}{x^2 + x + \alpha^2 + \beta} \) as it has pairs of imaginary factors, and then proceed as before. We
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We cannot extend our remarks to a greater length in this article; we must, therefore, refer the reader who wishes to see these principles more completely developed, to Euler's Analytis Infinitorum, vol. i. ch. 2 and 11; to La Croix's Algebra, and his Calcul Differentiel et Calcul Integral. See also Bonycastle's Algebra, and Simpson's Fluxions.

RATIONAL or true horizon, is that whole plane is conceived to pass through the centre of the earth, and which therefore divides the globe into two equal portions, or hemispheres. See Horizon.

It is called the rational horizon, because only conceived by the understanding; in opposition to the sensible or apparent horizon, which is visible to the eye.

RATIONAL integer, or whole number, is that of which unity is an aliquot part. See Number, and ALIquot part.

RATIONAL MIXT number is that consisting of an integer, and a fraction; or of unity, and a broken number.

Commensurable quantities are defined by being one to another as one rational number to another.

For unity is an aliquot part of a rational number; and a fraction has some aliquot part common with unity; in things, therefore, that are as a rational to a rational number, either the one is an aliquot part of the other, or there is some common aliquot part of both; therefore they are commensurable.

Hence, if a rational number be divided by a rational, the quotient is always a rational.

RATIONAL Physicians, in ancient medical history, the physicians of the dogmatic sect, who stood in opposition to the empiric sect; the former appealing to certain theoretical principles in the application of remedies, while the latter relied entirely upon experience, and disclaimed all knowledge of first principles. The tenets of both these sects have been handed down to us by a classic author, Celsus, and have been given at length under a former article. See EMPHIC.

RATIONAL Quantity, or number, a quantity or number commensurable to unity.

Subposing any quantity to be 1, there are infinite other quantities, some of which are commensurable to it, either simply, or in power; these Euclid calls rational quantities.

The rest, that are incommensurable to 1, he calls irrational quantities, or jurels.

RATIONAL Ratio. See RATIO.

RATIONAL Soul. See SOUL.

RATONALE, a solution or account of the principles of some opinion, action, hypothesis, phenomenon, or the like. Hence.

RATONALE is also the title of several books. The most considerable is the "Rationale of Divine Offices," by Guil. Durandus, a celebrated school-divine, bishop of Mende, martyred in 1286, as he himself tells us. See PRINTING.

RATONALE also denotes an ancient furred tippet, worn by the high-priest under the old law; and called by the Hebrews, הָרָתָּה, hophesh; by the Greeks, ἡπεθος; by the Latins, rationale, and pelorale; and by the English translators, breast-plate.

The rationale was a piece of embroidered stuff worn on the breast, about a span square. Du-Cange describes it as a double square of four colours, interwoven with gold, and set with twelve precious stones in four rows, on which were engraved the names of the twelve tribes, and fastened to the shoulder by two chains and two hooks of gold. The form of the rationale was prescribed by God himself, Exod. xxviii. 15—29.

A rationale appears also to have been anciently worn by the bishops under the new law. But authors are in doubt about its form; some will have it resembal of that of the Jews; others take it to be only the pallium.

RATIONALIS, an officer mentioned in several ancient inscriptions.

Laenepius, in the life of Alex. Severus, uses rationalis as synonymous with procurator.

The rationales were intendants or surveyors under the emperors; and though Laenepius pretends they were first established by Severus, it is evident there were some under Augustus.

RATIONALIUM, among the Romans, a book which contained the accounts of the empire. It was otherwise called breviarium. See BREVIARY.

RATIONIS ENS. See Ens.

RATIONIS Dificitio. See DISTINCTIO.

RATONIS OS, in Anatomy, the bone of the forehead, otherwise called os frontis.

RATIBON, or REGENSPURG, in Geography, an imperial city of Germany, in the circle of Bavaris, and capital of a bishopric of the same name, situated at the confluence of the Regen and of the Danube. The town is large, populous, and fortified; and was anciently the capital of Bavaria, and the residence of its dukes. The emperor Frederic I. annexed it to the empire. This town is a staple, but neither its manufactures nor trade are very considerable; corn, wood, and provisions, are sent by the Danube to Vienna. The number of inhabitants is about 24,000; 62 miles N.E. of Augsburg. N. lat. 48° 55'. E. long. 12° 50'.

The bishopric of Ratibon comprehends about 1383 parishes; and was founded, as it has been supposed, by St. Boniface, in the year 736. The seat of the bishop is at Ratibon, where, however, he has no jurisdiction.

RATISKA, a town of Immervia; 35 miles N.E. of Cotatis.

RATKAI, George, in Biography, born in 1613, of a noble family, in Hungary, entered into holy orders, and was made canon of the church of Zagrab. He obtained the see of the vicar of Croatia, John Drakovitz, who engaged him to compose the history of that province, and gave him free access to its archives. He accordingly published, in 1652, a very learned work, entitled "Memoria Regum et Banorum regnorum Dalmatiae, Croatia, Slavonie, inchoata ab origine sua ulque ad annum," Gen. Biog.

RATLINES, or, as the seamen call them, Rutlins, or Ratlings, are certain small lines which traverse the throns of a ship horizontally, at regular distances above the dead-eyes upwards, and forming a variety of ladders, whereby to climb to any of the masts, or ascend from them. Hence the term seems to be derived from ratb, an obsolete word, signifying a hill. In order to prevent the ratling from slipping down by the weight of the sailors, they are firmly attached by a knot, called a close-bitch, to all the throns, except the foremost or aftermost; where one of the ends, being fitted with an eye-splice, is previously fastened with twine-thread or pack-thread. Falconer.

RATNO, in Geography, a town of Lithuania, in the palatinate of Brzefz; 50 miles S.E. of Brzefz.

RATTOATH, a poor village of the county of Meath, Ireland, which, before the union, had its representatives in parliament. It gave name to a barony, and is 12 1/2 miles N.W. by N. from Dublin.

RATOLY, a town of Hindoostan, in the circar of Gohud; 25 miles S.E. of Ratt.

RATONES, a small island in the river La Plata, near Monte Video.

RATSCHA,
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RATSCHA, or Retzka, a fortress of Sclavonia, on the N. side of the Save, opposite to the mouth of the Drin; 35 miles S.W. of Peterwardein.

RATSCHZ, a town of Moravia, in the circle of Brunn; 10 miles N.E. of Brunn.

RATURZ, a town of Hindooftan, in the circle of Aurungabad; 65 miles E. of Aurungabad.

RATTAK, a town of Bengal; 14 miles S.S.E. of Curquckpou.

RATTAN. See Ruatan.

Rattan Canes. See Canes.

RATTELS DORF, in Geography, a town of Bavaria, in the bishopric of Bamberg; 9 miles N. of Bamberg.

RATEN. See Ratzen.

RATTEN, in Rural Economy, a provincial word, used to signify a rat.

RATTENBERG, in Geography, a town of the county of Tyrol, with a citadel on the Inn; 16 miles E.N.E. of Innsbruck.

RATTEN, a town of the duchy of Holstein; 6 miles N.N.W. of Lubeck.

RATTLE, among the Ancients, a musical instrument called by the Romans crupitaclum. Mr. Malcolm takes the tintinnabulum, crotalum, and sistruum, to have been only so many different kinds of rattles. The invention of the rattle is ascribed to the famous mathematician Archytas; whence Aristotle calls it Archytas puellae, Archytas's rattle. Diogenianus adds the occasion of the invention; viz. that Archytas, having children, he contrived this instrument to prevent their tumbling over things about the house. So that how much fower some instruments have changed their uses, the rattle, we are sure, has preferred its original application.

RATTLE, or Rattel, in Commerce, a weight in Arabia; a rattle of coffee contains, at Betelagus, 14½ vikas, and a farcel, or frazil, of 10 maunds, or 20 rattles, contains 290 vikas; a farcel weighs 20 lb. 6 oz. 4 dr. avoirdupois, and a bahar of 40 farcelles = 815½ lb. avoirdupois; 10 farcelles in Betelagus are equal to 7 in Mocha; 16 vikas of dates, candles, and iron, are reckoned to a rattle; but of all other forts of goods 15 vikas make a rattle. The rattle is used in the bazar, or market, only. At Jiddah, another sea-port of Arabia, in the Red sea, the bahar contains 10 frazils, 100 maunds, or 500 rattles, and the rattle 15 vikas. The bahar weighs 222½ lb. English troy, or 183 lb. avoirdupois; and the maund 29 oz. 4½ dr. avoirdupois. Kelly's Un. Cambil.

RATTLE-Gra.S. See Rhinanthus.

RATTLE-N. See Wolf Net.

RATTLE, Red. See Pedicularis.

RATTLE, Yellow. See Rhinanthus.

RATTLE-SNAKE. See Snake.

RATTLE-SNAKE Root. See Snake-root.

RATTLE-SNAKE Root, Dr. Witt's, a species of Prenanthes; which fee.

RATTLE-SNAKE Weed, a species of Erygium; which fee.

RATTLE-SNAKE Islands, in Geography, a cluster of small islands at the western extremity of lake Érie.

RATTLE-SNAKE Mountains, mountains of New Hampshire; 38 miles N. of Concord.

RATTLING in horses, a term applied to a disagreeable noise produced in them by the entrance of the air between the internal parts of the sheath and the prepuce or covering, principally taking place in trotting or going fast.

RATTOONEAU, in Geography, a small island at the entrance of the harbour of Marseille, which has a fortress erected in the 17th century by the duke of Guise.

RATTREY HEAD, a cape of Scotland, on the N.E. coast of the county of Aberdeen; 7 miles N. of Peterhead. N. lat. 57° 12'. W. long. 1° 44'.

RATULAH, a town of Hindooftan, in Oude; 15 miles N.E. of Fyzabad.

RATWAH, a town of Hindooftan, in the circle of Gohud; 27 miles E. of Gwalior.

RATZER, in Commerce, the name of a small coin, struck at Frifburgh, &c. nearly of the same value with the blare, which, in France, is worth two fols and a denier.

RATZEBURG, in Geography, a town of Hinder Pomerania; 14 miles S. of New Stettin. N. lat. 53° 30'. E. long. 16° 14'.

RATZBURG, a town of Germany, which gives name to a principality, situated on an island in a large lake; the lake is 30 miles long, and 9 broad, and boats pass by it to Lubeck with goods and passengers. It was burnt by the Danes in 1693, and since that danger the streets have been regularly laid out, and the houses are built after the Dutch manner. In the market-place is the registry-office, and here is held the chief court of justice and the consistory; the garrison is quartered in barracks; 20 miles S. of Lubeck. N. lat. 53° 45'. E. long. 15° 46'. The principality of the same name is situated between Mecklenburg and Saxe-Lauenburg, and extends about 10 miles each way. The soil is fertile, and produces a considerable quantity of wheat, besides feeding a number of cattle. It was converted from a bishophoi into a principality by the peace of Westphalia. It belongs to Mecklenburg-Strelitz.

RATZENSTEIN, a town of the duchy of Styria; 5 miles S. of Windisch Gratz.

RATZKUTZCHA, a town of Hungary; 10 miles N.N.W. of Cakathurn.

RAVA. See Rawa.

RAVALEMENT, Fr. equivalent, among organ-builders and harpsichord-makers, to compass as English. The complete set of keys, or whole system of musical sounds, (said Roussel in 1768,) instead of confining itself to four octaves, like common keyed-instruments formerly, extends now to five octaves, adding a fifth below double C, and a fourth above C in alt., including five octaves between the lowest F and the highest. (This was the common compass of our harpsichords made by Tabel, Kirckman, and Shudi, long before 1768.) The word ravalement is confined to keyed-instruments; there are no others of so extensive a compass as five octaves. But in the year 1777, when Dr. Burney first composed and published duets “a quatre mains,” or for two performers on one instrument, the ladies, at that time wearing hoops, which kept them at too great a distance from each other, had a harpsichord made by Merlin, expressly for duets, with five octaves; extending from the octave below double C in the base, to the octave above C in alt. in the treble. And as duets a quatre mains have been composed by all the great masters in Europe since that time, instruments with additional keys are now become general. At first it was only in the treble that the compass was extended, except in the instrument above-mentioned by Merlin; but at present notes are added in the base to complete the five octaves, and, indeed, the additional notes in the base are better worth having for particular effects, than those in the treble; which often, from the shortness of the strings and feeble vibration, more resemble the tone of wood than wire; whereas the tone of those in the base of large piano fortés, by the bell makers, is so rich and full, that
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that each found below double F resembles that of an organ-pipe in flow notes, more than the transient tone of a string.

Roufleau very justly observes, that almost all instruments are limited in their compass below, except harps and instruments with keys. The violoncello can go no lower than double C, its 4th string, nor the violin below G. The flute and hautbois descend only to D and C. But the notes in alt. have been extended in the acute to founds that are seldom in tune, and never pleasing. Like rapid notes of difficult execution, they surprize, and the performer's dexterity is applauded; but neither the harmony nor the melody of very high or rapid founds can excite rapture like those of moderate quickness, when produced with feeling and expression, in the middle of the scale.

RAVALSHE, in Geography, a town of Sweden, in Weft Gothland; 24 miles N.W. of Uddevalla.

RAVANA, in Hindo Mythology. See RAVENA.

RAVANAK, in Geography, a town of European Turkey, in Macedonia; 16 miles E.S.E. of Saloniki.

RAUAND, a town of Persia, in the province of Kerman; 105 miles E. of Sirgan.

RAVA-POU, in Botany, Rheede Hort. Malab. v. 4. 99 t. 48; a plant erroneously cited by Linneus for his very different Nyctanthes bifiuta. See GUETTARDA Speciosa.

RAUCA AVIS, in Ornithology, the name of a bird described by Nieremberg, as common about the lakes and rivers of America, and of the kingfisher kind, but nearly as large as a duck, and black on the crown, and white on the breast and belly. Its neck is naturally very long in proportion to its body, yet it can occasionally contract and shorten it in a very wonderful manner. It is a native of Mexico, and is esteemed very good for the table. Mr. Ray has placed this among the birds, the accounts of which he is distrustful of.

RAUCH, in Geography, a town of Germany, in the lordship of Schwarzenberg; 10 miles S.W. of Scheinfeld.

RAUCHENEGG, a town of Austria; 2 miles W. of Baden.

RAUCHT, a town of Russia, in the government of Viborg, near lake Ladoga; 44 miles S.E. of Viborg.

RAUDANAGUR, a town of Bengal; 50 miles E. of Ramgar.

RAUDEHN, a town of Prussia, in the palatinate of Culm; 10 miles N.E. of Culm.—Alfo, a town of Silesia, in the principality of Ratibor; 12 miles N.E. of Ratibor.

RAUDNIZ, a town of Bohemia, in the circle of Schlan; 12 miles N.N.E. of Schlan.—Alfo, a town of Bohemia, in the circle of Chrudin; 16 miles N.N.W. of Chrudin.

RAUDRI, a name of the Hindo goddess Parvati, confort of Siwa, the destroying power. In this character she may be considered as Sakti, or energy in her form of Rudra, or Fate. Rudri, and Rudrani, are other modes of writing this name of the goddess in her avenging character, in which she does not apparently differ much from her attributes, as Sakti of Mahakala; under which name, and the others occurring in this article, distinguished by italics, farther and sufficient information may be sought. See also TRISAKTI-DEVI, and TAMAS.

RAUDTEN, in Geography, a town of Silesia, in the principality of Wohlan; 18 miles N.W. of Wohlan. N. lat. 51° 30'. E. long. 16° 15'.

RAVEL BREAD, a sort of bread, called also black wheat; as being of a middle fineness between white and brown.

RAVELIN, in Fortification, was anciently a flat bastion, placed in the middle of a curtain.

RAVELIN is now a detached work, composed only of two faces, which make a salient angle, without and sometimes with flanks; and raised before the curtain on the counter-fearp of the place; serving to cover it and the joining flanks from the direct fire of an enemy.

A ravelin is a triangular work, resembling the point of a balloon, with the flanks cut off. (See Plate V. Fortification, fig. 4. lit. i. i. &c.) Its use before a curtain is, to cover the opposite flanks of the two next bastions. It is used also to cover a bridge or a gate, and is always placed without the moat.

What the engineers call a ravelin, the soldiers generally call a demi-lune, or half-moon. See DEMI-LUNE.

There are also double ravelins, which serve to defend each other. They are said to be double when they are joined by a curtain.

Ravelins, or half-moons, are constructed by setting off 50 toises from the re-entering angle O of the counter-fearp (Plate VII. Fortification, fig. 4.) on the capital O L of the ravelin, or on the perpendicular produced, and from the point L drawing lines to the shoulders A, B; whole parts L M, M N, terminated by the counter-fearp, will be the faces M O, O N, the semi-gorges of the ravelin required.

Others will have the faces of the ravelin to terminate on tofe of the bastions within three toises of the shoulders, in which case the ravelins cover the flanks better than the others. The ditch before the ravelin is 12 toises, and its counter-fearp parallel to the faces of the ravelins, and made in a circular arc before the salient angle. When the ravelins are made with flanks, the faces should terminate two of the bastions, at least 5 toises from the shoulders. These flanks are made by setting off 10 toises from the extremities of the faces, and from the points thus determined, the flanks are drawn parallel to the capital of the ravelin. When redoubts, or keeps, are formed in the ravelin, this is done by setting off 16 toises from the extremities of the faces, on the semi-gorges from M to b, and from M to a; and from the points b, a, the faces are drawn parallel to the face of the ravelin; the ditch before this redoubt is 6 toises, and its counter-fearp parallel to the faces. This work should be covered in the faces of a wall, a foot or two thick, furnished with loopholes for the musketry to fire through; and it will serve to secure a retreat for the troops who defend the ravelin; they may thus prevent the enemy from making a lodgment in the outward part of the ravelin, or at least greatly obstruct their attempts for this purpose. Nor can they be drove from this place, until the enemy has erected a battery, and brought cannon on the ravelin to batter the redoubt. When the counter-gate (which fe) is placed before the ravelin, 40 toises are set off on the capital of the ravelin from its salient angle to the salient angle of the counter-guard, and 10 on the counter-fearp of the ditch. For the construction of crown-works before the ravelin, see HORN-work. Within the ravelin are constructed a rampart of about 16 or 20 yards, and a parapet of about 6 yards; ramparts are also annexed in the slope of a rampart, and a barbette, when it is proper, is constructed in a salient angle. In wet ditches, where the troops pass from the town to the ravelin in boats, it is proper to make, in the gorge of the ravelin, a kind of harbour, where the boats may be covered from the fire of the enemy. In dry fosses, there should be ramps or stairs in the gorge of the ravelin, to preserve a free communication, if the bridges should be broken down by the enemy's shot. The celebrated general Cochon, in the ravelins which he built at Bergen-op-zoom, contrived a very good defence for the covered way before the faces of the bastions, by making retired flanks in the breasts of the ravelin, where
R A V

one or two cannon might be placed as secure from the enemy's fire as those behind the orillon of a bastion. See Military Construction.

Ravello, in Geography, a sea-port town of Naples, in Principality Citra, the fee of a bishop, united to Scala; 11 miles W.S.W. of Salerno. N. lat. 40° 39'. E. long. 15° 10'.

RavelWater, a river of the county of Antrim, Ireland, rising in the mountains in the northern part, and flowing through Ravel Glen to the river Main.

Raven, Corvus corax of Linnaeus, in Ornithology, a large bird of the crow kind, well known throughout the world, as being found in all climates, and all regions. The colour of the whole bird is black, finely glossed with a rich blue, the belly excepted, which is dusky. The ravens build in high trees, or upon the ruins of lofty buildings in the neighbourhood of great towns, being held in the same veneration as the vultures are in Egypt, and for the same reason; for, to devour the carcasses and filth that would otherwise prove a nuisance. They lay five or six eggs, of a pale greenish colour, marked with small brownish spots. There are many fabulous stories of the longevity of the raven; but birds are in general long lived, and the crow kind not less so than the raven. The raven is a very docile bird, and may be taught to speak, as well as to fetch and carry. In clear weather, ravens are remarked to fly in pairs at a great height, making a deep loud noise, different from the common croaking; and their crient is remarkably good. See Corvus Corax.

The quills of a raven are used in tuning the lower notes of a harpsichord, when the wires are set at a considerable distance from the fiddles. It is rare to find this creature white, yet it happens sometimes. Boyle mentions one. There was also one shewn to the Royal Society some years ago. Boyle's Works Rbr. vol. ii. p. 46.

Raven, Night, an English name for a heron, which flies in the night, and makes a very odd and hoarse noise. It has been applied to some to the bittern, or ardea balearis, but improperly, belonging of right to the smaller grey heron, called nitrogen. See Nitrogen.

Raven, Sea, or Corvus marinus. See Corvus Aquaticus.

Ravena, in Hindu Mythology, is the name of a celebrated king of Lanka, or Ceylon. Such was his prowess, and the oppression which he exercised over his subjects, that he became necessary for Vishnu, the preserver of the deity, to defend on earth for his destruction, and the relief of the suffering world. He accordingly became incarnate in the person of Rama, and the wars that ensued between the forces of the tyrant and the divine general, for the recovery of Sita, his ravished spouse, are the subject of the fine epic poem, the Ramayana; under which article of this work, and under Ranya, and others thence referred to, the poem, and the historical traditions connected with these points, are sufficiently described and discussed.

Although obscured by mythological fables, these perfons and wars are admitted to have had historical existence; and some important points of chronology hinge upon them. We have, therefore, in this and other articles, noticed at some length the legends connected with these subjects.

In the Hindu theogony, the origin of Ravena is thus related. Two ethereal warders of Vishnu's palace carried the pride of office so far as to inflit the seven Maharthis, (see Maharthis, or Rishis,) who had come to offer their adorations. The offended deities pronounced an imprecation on the insolent warders, condemning them to be adhe-

yoni, or born below, thrice in mortal forms, before they could be re-admitted into the divine prehence. The imprecation of a Rishi, even if provoked by a god, is scarcely to be averted; and the offenders, in consequence, appeared in their first birth as Hiranayaka, or golden-eyed, and Hiranayakipuro, or clad in gold; secondly, as Ravena and Kumbhakarna; and lastly, as Kansa and Sipulora.

The history, if such it may be called, of Ravena, Rama, &c, is perpetually alluded to in Hindu writings; the Ramayana, containing an infinity of such legends being one of the most popular works of the East. Ravena, or Ravana, has become a generic name for a tyrant. He is also called Dasagriiva, or the ten-necked; he being usually represented with that number of heads, and twenty hands, symbolical of suppliance and prowess. A couplet in the Ramayana may be thus translated. Where Ravana is, the fun lores his forces, the winds cease to blow, the fires cease to burn; the rattling ocean, seeing him, flulls its waves. Such are the hyperbolical relations of his potency, obtained by the usual process of self-inflicted austerities. So ardent was he in this irrefrangible species of merit, that he offered to Siva nine of his ten heads successively; and thus extorting the favour of the condescending deity, pleased with such an important sacrifice, he obtained a promise, with some equivocal stipulations, of whatever he should desire.

This sort of austerity is called Tapas, under which word some account is offered of various modes of practising it. The gods and demi-gods, alarmed at Siva's promise, besought him to recall it. But such conduct is deemed unbecoming in deities, who, however, do not scruple to evade the performance of their promises by deceit or prevanation: and, on this occasion, Nareda was deputed to found Ravena as to what he would demand, which, as usual, was universal dominion, &c. Nareda artfully persuaded Ravena that Mahadeva, or Siva, his promised, was drunk, and had pronounced him what he could not perform; whereupon the vindictive giant tears up Kailasa, the pantheon of Siva, which, being contrary to the stipulations, releashes Siva from his promise, and he confines to the destruction of Ravena, which is brought about by the avatars or deyants, of Vishnu in the person of Rama. From this story we are told to learn that all worldly affairs are the predestined ordinances of providence; whose will, that any event should take place on earth, includes sufficiently all the routine and detail of its accomplishment; although we only see the links of a chain of causes leading naturally to its effect.

We will here add an extract from the Hindu Pantheon, whence a considerable part of this article is taken, shewing how unceasingly the mythological machinery of that poetical people is introduced into their popular works. The names distinguished by capital imply that articles are given under those words, in this work; and a reference may be made to them for any defined information.

"Respecting Ravena," says the author of the publication adverted to, "I will notice but one more tale, as related to me by a Brahman; who, unable fully to make me feel the poetical beauties, or comprehend the morality of the Ramayana, bluffed while he developed its follies; which, in conformity with popular taste, or if taken separately, are apparently very numerous; although it must be confessed, they are so contrived as to be intimately connected with the main action of the poem. The following idle tale is of this description; but shall not here explain the causes that led to the predication, or the consequences that ensued."

"Ravena, by his power and infernal arts, had subjugated all
all the gods and demi-gods, and forced them to perform menial offices about his person and household. Isyra made garlands of flowers to adorn him withal. Agni, or Parvaka, was his cook. Sukra, regent of the sun, supplied light by day; and Soma, regent of the moon, by night. Varuna, the Hindoo Neptune, purveyed water for the palace. Kuvera, their Pluto, furnished cash. The whole nine planets (the nine planetary spheres, including Rahu and Ketu) sometimes arranged themselves into a ladder, by which, they serving as steps, the tyrant ascended his throne. Braha (for the great gods were there also, and I give this anecdote as I find it in my memoranda, without any improved arrangement) was a herald, proclaiming the giant's titles, the day of the week, month, &c. daily in the palace; a sort of speaking almanac. Mahadeva, in his character or incarnation of Kandeh-Rao, performed the office of barber, and trimmed the giant's beards. Vishnu had the honourable occupation of instructing and drilling the dancing and singing girls, and selecting the fairest for the royal bed. Ganea, or Pollear, had the care of the cows, goats, and herds. Vayu swept the house. Yama washed the linen. And in this manner were all the gods employed in the menial offices of Ravena, who reburked and flogged them in default of industry and attention. Nor were the female divinities exempted: for Parvati, in her form of Sati, was head Aya, or nurse, to Ravena's children. Lakshmi and Saraswati were also among them, but it does not appear in what capacity. Earthly kings and queens were also forced into this degrading servitude, to the number of ninety-six royal families; as is said to be detailed in the Ramayana. But I have some doubt if such a relation be actually in this shape, in that poem: this we shall see, when its other books are translated and published. In my abstract of it, however, such a godly predication seems essential to the main action; Rama being thereby impelled by every consideration of piety and duty to immediate and immediate energetic measures, for the relief and liberation of the degraded divinities.

Ravana, as we have noticed, is surnamed Dala-griva, or the ten-headed. He is also called Vifrvana, or fon of Vifrava, the father likewise of Kuvera. The brothers are sometimes named Pulafja, or Pualafja. (See these articles.) Another of his names is equivalent to lord of Rakhasas, a race of malignant beings, common agents in the hands of superhuman tyrants for the annoyance of the virtuous portion of mankind, or thwarting the benificent views of the gods. Many specific varieties of these demons are enumerated in the first book of the Ramayana, as aiding Ravena in defence of himself and his kingdom of Lanka. In pictures illustrative of the Ramayana, which are very common throughout India, they are depicted especially ill-favoured, painted green, red, blue, &c. and engaged in fierce contortions with Rama's humanfoldery. Several generations of these Rakhas, each of 14,000, were destroyed by Rama. See Raksha.

RAVENALA, in Botany, Adans. Fam. des Plantes, v. 2. 67. See Uranka.

RAUENBACH, in Geography, a town of Germany, in the principality of Ansbach; four miles S.S.W. of Ansbach.

RAVENGLASS, a market-town and sea-port in the parish of Muncaster, Allerdale ward, above Darwent, county of Cumberland, England, is situated on the Solway Frith, near the confluence of the rivers Esk, Mite, and Irri. Though possessing many advantages for trade, it is but a poor place, and chiefly supported by its oyster fishery, for which it is much celebrated. This town stands at the distance of 57 miles S.S.W. from Carlisle, and 287 N.W. by N. from London. The manor originally constituted part of the barony of Egremont, but was granted to Richard Lucy to the Penningtons, from whom the present owner, Lord Muncaster, is lineally descended. The market day is Saturday, weekly; and there are two annual fairs, one of which is held on the eve, day, and morrow, of St. James, and is remarkable for the ceremonies attending its proclamation and continuance. On the first day, the earl of Egremont, or his proxy, attends, accompanied by the fequeant of the borough of Egremont, with the insignia, called the Bow of Egremont; by the foresters, with their bows and arrows; and by all the tenants of the forest of Copeland, who hold their confirmations by the special service of attending the earl, or his representative, during the fair. On the third day, at noon, the earls, officers, and tenants of the forest, depart, after profession; and lord Muncaster, and his tenants, take formal possession of the place, and the day is concluded by horse-racing, and various rustic diversions.

Near Ravenglas, on the northern bank of the river Esk, stands Muncaster-houfe, the seat of lord Muncaster; and eft from it, on the opposite side of the river, are seen ruins of considerable magnitude, respecting which no historical documents are known to exist. They are now called the city of Barnsley; and its foundation is ascribed, by tradition, to the Danes, who are said "to have gathered for its inhabitants the men of Drig, and the women of Becket" from the popular saying, "let us go together like lads of Drig and lasses of Becket." These ruins extend about three hundred yards in length from east to west, and 100 in breadth, from north to south; and are enclosed, except at the east end, by a wall, nearly three feet in height. "There appears," says Hutchin, "to have been a long street, with several crofs ones; the remains of the house-heads within the walls are not very numerous; but on the outside they are innumerable, especially at the south side and west end. The circumference of the city, and suburbs, is nearly three computed miles; the figure is an oblong square. There is an ancient road through the city, leading from Ulpha to Ravenglas. About the year 1730, a considerable quantity of silver coin was discovered in the ruins of one of the houses, concealed in a cave formed in a beam." A History of the County of Cumberland, &c. by William Hutchin, F.S.A., two vols. 4to. Beauties of England and Wales, vol. iii., 1802, by John Briton and Edward Wedlake Brayley.

RAVENNA, a very ancient city of Italy, in the department of the Amone, seated on the river Mentone, near the Adriatic. This city, as Strabo informs us, was built by the Thessalians, on several islands, long before the war of Troy, and they were driven out by the Trojans. In the time of this Greek writer, it was situated in the midst of a marsh, and attached to the continent, and in process of time the Po accumulated mud and sand, so that the land was raised and the sea removed to a greater distance. The same writer informs us, that it was made a Roman colony by Augustus; and Dion says, that a fleet of 250 vessels was stationed in this port by that prince, from which circumstance it was called "portus classis." or the port of the fleet. He stationed, lays Suetonius, one fleet at Milemum, and another at Ravenna, for guarding the upper and lower sea. Tiberius repaired its walls, and erected some new gates, which fill bear an inscription to this purpose. Trajan also contributed towards embellishing this city. Honorius made it the place of his residence, both before and after Alaric had captured and burned Rome. When Odoacer made a conquest of Italy, he refided at Ravenna, and dallustrated here a siege.
of three years, at the termination of which he was taken and slain by Theodoric. Theodoric fixed the seat of his empire in this place, and adorned it with magnificent churches and palaces, and re-constructed the aqueduct of Trajan. His daughter Amalaetha, and his grandson Athalaric, contributed towards the improvement of this city. When the Goths were driven from Italy by Narves, general of the emperor Julianus, he was made governor of Ravenna; and having continued in this station for 16 years, he was recalled by Julian II., successor to Julianus; and in the year 567 he was succeeded by Longinus, who took up his residence at Ravenna, under the title of exarch. (See Exarch.)

The famous battle of Ravenna was fought near this town between Gafon de Foix, duke of Nemmas, and nephew of Louis XII., and the army of pope Julius II., Ferdinand, king of Spain, and the Venetians, in which the former young general, being only 24 years of age, having killed between 16 and 18,000 of the enemy, proved victorious, though he himself was killed by too ardently following the pursuit. This happened on Easter-day 1512. The French, enraged by the loss of their brave general, took Ravenna by storm, and pillaged the city with such severity that it has never recovered. On the road to Forli, by the banks of the little river Rocco, three miles from the city, a crofs shews the spot where Gafon de Foix was killed. Fresh water has always been focarce at Ravenna, that it has occasioned a pleasant epigram by Martial. This city was of late the capital of Romagna, with the title of an archbishopric. It has produced several perfons of eminence, as Faufinus, often mentioned by Martial; the bishop Alpafius, who lived under the reign of Alexander Severus; Caifiodorus, chancellor to Theodoric, king of the Goths in Italy; pope John XVII.; Peter Damien, cardinal of Ofa, and several others. Ravenna was also the seat of many councils at Succesive periods. The three last councils, in 1311, 1314, and 1317, were summoned for the purpose of reforming the corrupted manners of the ecclefastics, which were, in those days, very debauched. It is now a mean and inconsiderable town; the houses are old and in a ruined state, and the number of inhabitants scarcely amounts to 14 or 15,000. In the time of the Romans, it was seated on a kind of bay formed by the Adriatic, and its harbour was celebrated; but it is now three miles from the sea. The mud thrown up by the tide having formed a tract of land, which is cultivated, and on which the city itself has been enlarged towards the sea. The air is infalubrious; but has been somewhat amened by conveying along the sides of the city the rivers Mentone and Ronco, which carry off the fetid water from the marfy grounds. It contains several churches, and 24 convents; 42 miles E. of Bologna. N. lat. 44° 27'. E. long. 11° 5'.

RAVENPOINT, a headland of the county of Wexford, Ireland, at the N. side of the entrance into Wexford haven. N. lat. 52° 23'. W. long. 6° 18'.

RAVENSARA, in Botany, a barbarous appellation, altered by Sonnerat from the Madagafcar name of the plant, Raven-fara, or Varavensara, meaning, it feems, a good leaf, and applying to the aromatic qualities, and economical uses, of the leaves. Hence Juffieu was induced to contrive the apt generic name Agathophyllum, from Agathos, good or profitable, and Phillos, a leaf; under which this genus ought to have been described in its proper place, in our firft volume. But one of our predeceffors has, by mistake, referred the reader to Ravenfara, as a genuine Linnean name, attributing Agathophyllum to professor Martyn; see that article. To correct this error, and supply the confquent deficiency, we subjoin an account of the tree in question, under its proper and received denomination.
Weilphalia. The approaching congress (1814) may possibly fix its future destination.

RAVENSBURG, a town of Bavaria, which anciently belonged to the Guelphs, counts of Altorf; but it was an imperial town before the time of king Rodolphus, and continued such till the year 1802, when it was given, among other indemnities, to the elector of Bavaria. The Roman Catholics and Lutherans are united with regard to the temporal and spiritual concerns of the place, and the magistracy is shared betwixt them. They have one church in common; but the Lutherans are exclusively poleved of another, and the Roman Catholics have also two parih-churches; 21 miles N.E. of Constance. N. lat. 47° 41'. E. long. 9° 38'.

RAVENSBURN, a small stream of England, which runs into the Thames between Greenwich and Deptford.

RAVENSCHROFT, Thomas, in Biography, an active English musician and publisher, who flourished from the beginning of the 17th century to 1653. He was the editor and compositor of the best collection of psalm tunes in four parts, which had till then appeared in England. He was a bachelor of music, and a professor not only well acquainted with the practice of the art, but seems to have bestowed much time in the perusal of the best authors, and in meditation on the theory.

This book, published in small octavo, 1621 and 1633, contains a melody for every one of the hundred and fifty psalms, many of them by the editor himself, of which a considerable number is still in use; as Windor, St. David's, Southwell, and Canterbury. There are others, likewise, which are sung by the German, Netherlandish, and French Protestants. To these the bafe, tenor, and counter-tenor parts have been composed by twenty-one English musicians: among whom we find the names of Tallis, Dowland, Morley, Bennett, Stubbs, Farmery, and John Milton, the father of our great poet. The tunes which are peculiar to the measure of the 100th psalm, the 113th, and 119th, were originally Lutheran, or perhaps of still higher antiquity. And though Ravencroft has affixed the name of Dr. John Dowland to the parts which have been set to the 100th psalm, yet, in the index, he has ranked the melody itself with the French tunes; perhaps from having seen it among the melodies that were set to the French version of Clement Marot and Theodore Beza's Psalms, by Goudemel and Claude le Jeune. Ravencroft, in imitation of these harmonists, always gives the principal melody, or, as he calls it, the play-song, to the tenor. This part, indeed, he sometimes erroneously terms Fa-burden. This is a corruption of fauxbourdon, and false-bourdons, which originally implied such simple harmony as arises from a series of thirds and sixths to the base. His publication is, in some measure, historical: for he tells us not only who composed the parts to old melodies, but who increased the common stock, by the addition of new tunes; as well as which of them were originally English, Welsh, Scotch, German, Dutch, Italian, French, and imitations of these.

No tunes of triple time occur in Claude le Jeune, and but five in Ravencroft: the principal of which are Cambridge, Martyrs, Marcheller, and the 8İst. This last is still much used, and often played by chimies: it is called an imitation of a foreign tune, and has the name of Richard Alliton prefixed to it. Muller's German edition of the psalm tunes at Frankfort is exactly that of Claude le Jeune, in two parts only; except that he has tranposed some of the melodies, and inserted easy leading and connective notes, to assist, not only the finger, but sometimes the tunes them-
RAVILLY, a small town of the county of Carlow, Ireland, in the barony of the same name. It is situated on the river Slaney, 3 miles S. from Baltinglas, and 32 S. by W. from Dublin.

RAVINA, a town of European Turkey, in Albania; 32½ miles E. of Valona.

RAVINE, in Field Fortification, a deep hollow, usually formed by a great flood, or long continued running of water, frequently turned to good purposes in the field.

RAVIS, the fame with ravoedo. See Hoariness.

RAVISHMENT, in Law, denotes an unlawful seducing either a woman, or an heir in ward; for which there is a remedy by a writ of ravishment, or action of trespas sui & armis, de filio vel fillâ rapto vel adultero, in the same manner as the husband may have it de uxore rapitâ et adulâta, on account of the abduction of his wife. This action lay at the common law; and thereby the husband shall recover, not the possession of his wife, but damages for taking her away; and by statute Wilm. I. 3 Edw. I. c. 13. the offender shall also be imprisoned two years, and fined at the pleasure of the king. Both the king and the husband may, therefore, have this action; and the husband is also entitled to recover damages in an action on the cafe against such as persuade and entice the wife to live separate from him, without a sufficient cause.

Sometimes it is also used in the same sense as rape; which fee.

RAVISHMENT de Gard, is a writ which anciently lay, and still lies, for the guardian in toage against him who took from him the body of his ward, or pupil: but then he must account to his pupil for the damages he so recovers. It is expressly provided by statute 12 Car. II. c. 24. that testamentary guardians may maintain an action of ravishment, or trespas, for recovery of any of their wards, and also for damages, to be applied to the use and benefit of the infants.

RAVITZ, or Rawisch, in Geography, a town of the duchy of Warsaw, most of the inhabitants of which are Lutherans: it has a considerable manufacture of cloth; 24 miles S. of Posen.

RAVIUS, or Rave, Christian, in Biography, a learned German Orientalist, was born at Berlin in the year 1613. From a very early period he was attached to the study of the eallern languages, and after spending eight years in different universities on the continent, he came over to England in the year 1658, and took up his residence at the university of Oxford. He brought with him recommendations from Vossius, and other learned men; and was invited to Dublin by archbishop Usher, primate of Ireland, who settled upon him a handsome stipend, and engaged him to take a voyage into the East, for the purpose of collecting ancient manuscripts. About the same time he was invited by cardinal Richelieu to enter into his employment for a similar purpose, which he declined, having already accepted the proposals of Usher. In 1639 he became acquainted with our countryman, the learned Edward Pococke, at Conflantinople, where he improved himself in many languages, to which he had already applied his talents; and made himself master of the Turkish, Arabic, and Persian languages. In the mean time he did not neglect the main object of his mission, but collected more than 300 choice manuscripts. For this service he was, on his return, amply rewarded. In 1642 he taught the Oriental languages at Gresham college, in London. During the following year he went to Holland, and was appointed professor of the Oriental languages at Utrecht. We find him again in England in 1648, when he took the covenant, and was made fellow of Magdalen college, Oxford, by the parliamentary visitors. In the course of a few months he left England, and went to Sweden, where he obtained the appointment of professor of the Oriental languages at the university of Upfal. This place he was obliged to leave about the year 1657; the revenues, that ought to have been devoted to the Upfal professors, having been applied towards defraying the expences of the war between Sweden and Denmark. After this he for some time filled the chair of Oriental literature at the university of Kiel, and from thence he removed to occupy the same professorship at Frankfurt on the Main. He died in 1677, about the age of 64. His works are very numerous, of which the following are titles of the principal: "Observatio ad univerfam Europam pro dicendis Rebus et Linguas Orientalibus, ac conjugandae Africa atque Asia Eruditiones," 1644; "Orthographiae et Ana logiae vulgo Etymologiae Ebraicae Delinarum, juxta voces partes abractas;" "A Dicource of the Oriental Tongues, viz. Hebrew, Samaritan, Chaldee, Syriac, Arabic, and Ethiopic," 1649; "Concordiarius Hebraicarum et Chaldaicarum Epitome;" "Chronologia Biblica nova;" "Epitome varia 22 doct. Viro." He gave also to the world a translation, from the Arabic language, of Apollonius's Conic Sections. He had a brother, named John Ravis, who was professor of philosophy at Rostock, about the year 1638. In 1664-5 he was appointed counsellor and librarian to the elector of Brandenburg. He was author of "Commentarius in Cornelium Nepoten;" 1655; "Summa Studiorum pro Nobilitate Danica;" "Aphorismi Mili tares, and other learned works.

RAULIN, John, a French writer in the 15th century, was born at Toul in the year 1443. He pursued his studies at the university of Paris, where he obtained the degree of D.D. in 1480, and afterwards filled the professor's chair in theology with great distinction. He was elected grand master of the college of Navarre, and founded a good library in that seminary. Becoming dissatisfied with the world, he embraced the monastic life at the abbey of Cluny, in Burgundy, in 1497. He died in 1514, at the age of 71. He attracted much attention as a preacher, and several of his sermons have been published, which exhibit flinking specimens of the bad taste which prevailed in France in the 15th century. The works of this author were collected, and published at Antwerp, in 6 vols. 4to., 1612. They are accompanied with a curious and valuable collection of "Letters," that illustrate the history, manners, and sentiments of the age in which he lived. They were first published after his death, in quarto, in 1521, under the title of "Joannis Raulini Epistolae Illustrium Virorum." Moreri.

RAULT, Felix, the favourite performer on the German flute at Paris, in 1770; where we heard him ourselves with as much pleasure as a flute can give, by next execution, perfect intonation, and a mellifluous embouchure. M. Laborde has rendered his biographical article interesting by a detail of his professional merits and private character.

"M. Felix Rault was born at Bourdeaux, in 1736. He was the son of Charles Rault, of the king's band, and first balloon at the opera. Felix was received there in 1753, and in the king's band in 1768. His talents are so well known at Paris, as to be above praise. Since Blavet's time, no one has brought the art of playing upon the German flute to such perfection, especially in accompanying the voice; a much more difficult art than playing concertos of great execution, generally well studied at home previous to performance. But such study is useless to Rault; for no
one reads music more readily and with more facility, or gives it more meaning, than this performer. The beauty of his tone, the precision of his execution, the richness of his embouchure, however extraordinary, merit still less praise than his personal qualities, which endear him to all his acquaintance.” Laborde.

RAUMO, in Geography, a sea-port town of Sweden, in the province of Finland, on the E. coast of the gulf of Bothnia; 50 miles N. of Abo.

RAUNPIED, in Rural Economy, a provincial word used to signify flag-headed, and a name of one of the Hindoo hells; they reckoning twenty-one of these receptacles for sinners. Naraka is called Maharaurava, or moist dreadful.

RAURIS, in Geography, a town of the archbishopric of Salzburg; 32 miles S. of Salzburg.

RAUSCHENBERG, a town of Heife; 4 miles N. of Marburg. N. lat. 50° 53'. E. long. 8° 53'.

RAUSHENBERG, a town of Germany, in the principalcity of Culmbach; 7 miles N.N.E. of Neustadt.

RAUSNITZ, a town of Moravia, in the circle of Brunn; 10 miles E. of Brunn.

RAUTA LAMBI, a town of Sweden, in the government of Kuopio; 27 miles S.W. of Kuopio.

RAUTENBURG, a town of Prussian Lithuania; 27 miles W. of Tilsit.—Alfo, a town of Prussia, in the province of Samland; 36 miles N.E. of Königsberg.

RAUTERN, a town of Austria; 6 miles W.N.W. of Droffendorf.

RAUTIO, a town of Sweden, in the government of Ule; 56 miles S. of Braheлад.

RAUTPOUR, a town of Hindoostan, in Allahabad; 18 miles N.W.W. of Corah.

RAUTY DUNGEER, a town of Hindoostan, in Guzerat, on the coast; 50 miles S.W. of Noamagur.

RAUTY-Mummy, or Rauty-madder, bone-mummy, a name given by the people of the East Indies to a kind of foifie flower, much valued for its medicinal virtues. It is of the nature of the fucasies, and is found upon the high rocks, and supposed to be generated of the dew which falls from the heavens; but this is an idle opinion, and the formation of it is evidently the fame with that of the European rhomboidal seelentas. They beat it to powder, and after boiling it in milk, they give it in cafes of the venerable kind. In a common clap, they give half a scruple, night and morning.

RAUVEE, in Geography, a river of Asia, which rises on the borders of Thibet, and joins the Chunaub in the country of Lahore, 28 miles N.E. of Moultan. The Ravee is the "Hydroses" of Alexander, and though it is represented as a noble river, it is somewhat inferior in bulk to the Chunaub. Its sources are in the mountains near Nagorkote, a famous place of Hindoo worship; and it enters the plains near Shapour (called alfo Rajapour), from whence the famous canal of Shah Nahr was drawn to Lahore. 483 common cofles in length. The space between the Ravee and Chunaub, at their entry on the plains, is about 54 geographical miles; and they gradually approach each other during a course of 170 miles. The junction of the Ravee with the Chunaub (or rather the Chunaub and Behut collectively) is effected nearly midway between Teoulumba and Moutan. The Ayin Acbaree allows 27 cofles between the junction of the Behut and Chunaub, and that of the Ravee with the Chunaub; but this distance must be applied to the course of the river, not to the road by land. When these three rivers are united, they form a stream equal to the Indus itself, at the place of confluence; which is from 20 to 30 miles below Moutan. Reidell.

RAUWOLFIA, in Botany, was fo named by Plumer, in memory of Leonard Rauwolf, a native of Augsburg, and a pupil of Rondelet. He failed from Magdeburg in 1573, for the Levant, and performed a laborious and dangerous journey through Syria, Mesopotamia, Paletine and Egypt; of which he has left an account in German, full of curious information relative to medical and other rare plants, with several wooden cuts. He died physician to the Austrian army, at Havany, in Hungary, in 1606, according to Dryander, Bibl. Banks. v. 395, though Haller says 1596. The latter writer mentions his being obliged to quit his country on account of his religion, which was Protestant. His Splendid herbarium, once the property of queen Chriftina, and of Isaac Voffius, is preferred in the university of Leyden. From it Gronovius composed his Flora Orientalis.—Linn. Gen. 115. Schreb. 160. Willd. Sp. Pl. v. 1. 1217. Mart. Mill. Dict. v. 4. Ait. Hort. Kew. v. 2. 64. Juff. 148. Plum. Gen. 19. t. 40. Lamarck Illutr. t. 172. Gaertn. t. 52.—Clas and order, Pentandria Monogynia. Nat. Ord. Contorta, Linn. Apocin., Jull.

Gen. Ch. Cal. Perianth inferior, minute, with five segments, permanent. Cor. of one petal, falver-shaped; tube cylindrical, globose at the base; limb in five deep, rounded, emarginate, oblique segments. Stam. Filaments five, shorter than the tube; anthers erect, fimple, acute. Pet. of the middle roundifh; fhyly very short; fligia capitata. Peric. Berry nearly globose, marked with a furrow along one fide, of one cell. Seed two, convex at the base, tapers at the fummit, compressed, divided, more or less completely, into two cells.

Efl. Ch. Corolla oblique, falver-shaped. Stamens included. Berry globose, with two fefts, each of two cells.

1. R. nitida. Shining Rauwolfia. Linn. Sp. Pl. 303. Hort. Chiff. 75. t. 9. Willd. n. 1. Ait. n. 1. (R. tetraphylla angustifolia; Plum. Ic. 232. t. 236. f. 1.)—Leaves in fours, lanceolate, pointed, very smooth and fhiming. Flowers axillary, terminal, or umbellate, with a fmall umbel. Flowers axillary, terminal, or umbellate, with a fmall umbel. Stamens five. Perianth five. berry, a little bigger, rounder, and fower-shaped. Stamens five, dotted, shortly ovate, obtusely fide, of one cell. Seed two, convex at the base, tapering at the summit, compressed, divided, more or less completely, into two cells.


Native of New Spain. The whole plant is smooth. Stem fhruppy, a yard high, with plant, round, leafy branches. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks. Flowers scattered, rounded at the base, rather pointed, single-ribbed, two or three inches long, on fhortifh ftofalks.
clutters, opposite to the leaves. Berry obovate, with only one seed; at least in garden specimens, which very probably differ in those respects from wild ones. This species flowered at Madrid from August to October.

3. R. canescens. Hoary Rauwolfa. Linn. Sp. Pl. 303. Wild. n. 3. Ait. n. 2. (R. hirsuta; Jacq. Amer. 47. R. tetraphylla latifolia; Plum. Ic. 232. f. 256.)—Leaves in fours, elliptic-obovate, acute, downy. Flowers axillary or terminal. Segments of the corolla obtuse.—Native of dry, funny, bushy places in the West India islands, as well as on the neighbouring continent. It was cultivated by Miller at the same time with the first species. We received a specimen in flower, from the Iloalo at Kew, in June 1807. Jacquin says this species varies greatly in the size of all its parts, according to soil and situation, and in the height of its stem from one to eight feet. The young branches, flower-flats, flower-flats, and both sides of the leaves, are clothed with short dense pubescence, which almost entirely disappears by culture, though the upper side of the flower-flats continues rough with slightly glabrous. The leaves are from one and a half to two inches long, obovate, more or less inclining to elliptic, acute, unequall. Flowers in small, axillary, downy, flaked tufts, or umbels. Corolla green with a tinge of red, its segments obtuse. Fruit cloven at the top, first red, then black, containing two seeds, as Jacquin well describes it. One cell of each seed is usually, according to him, abortive.

4. R. tomentosa. Downy Rauwolfa. Jacq. Amer. 48. Obs. fasc. 2. g. t. 35.—Leaves in fours, obvato-lanceolate, downy, tapering at each end. Flowers axillary or terminal. Segments of the corolla acute.—Native of rocky places about Carthagena; sometimes on the ilone walls of the town. Jacquin alone seems to have known this species, which principally differs from the last, as far as we can judge, in having white flowers, the segments of whose corolla are acute and acute. The leaves moreover are rather tapering at each end; but that circumstance varies. Fruit the size of a pea, first red, then black. We have seen no specimen.

5. R. Pulaparia. East Indian Rauwolfa. Roxb. MSS. —Leaves in threes, elliptical, bluntly pointed, smooth and shining. Flowers terminal, in forked panicles. Corolla many times longer than the calyx. Sent by Dr. Roxburgh, from Calcutta, with the above name. We rely on him for the genus, having seen no fruit. This shrub is smooth in nearly every part, with round branches. Leaves about three inches long, and above one broad, coriaceous and shining; their transverse veins very fine and numerous. Flower-flats very minutely downy, as well as the imbricated bracteas, and keeled pointed segments of the calyx. Corolla apparently white, with a red tube, which is near three quarters of an inch long, cylindrical, swelling at the top; segments of the limb rounded.

Rauwolfa, in Gardening, contains plants of the tender, exotic, shrubby kind for the hove, of which the species cultivated are: the shining rauwolfa (R. nitida); and the hoary rauwolfa (R. canescens).

Method of Culture.—These may be increased by the seeds or berries, which should be sown in pots filled with light mould, in the autumn or spring, plunging them in a mild hotbed. When the plants have attained some growth, they should be removed into separate pots, and have the management of other exotic hove plants. They may likewise be raised by layers and cuttings, laid down or planted out in pots, plunged in the hot-bed in the spring and summer months, till they have intricate root, being afterwards managed as above from seed.

They afford much ornament and variety in hot-house collections, both in their foliage and flowers. RAUZAN, in Geography, a town of France, in the department of the Gironde; 9 miles S.S.E. of Libourne. RAUZZINI, VENAZIO, in Biography, a native of Italy, who, when he arrived here in 1774, to succeed Mil-lico at the opera, was a beautiful and animated young man, with a sopran voice. He was an excellent musician, having studied counterpoint with as much application as the art of fingering; so that he might truly be said not only to know his own business, but that of a maestro di cappella; having been as able to compose an opera as to perform a principal part in it. "Piramo e Tibbe," and "La Vertale," may be inflamed in proof of this assertion.

His voice was not very powerful when he came hither from Munich, where we first knew him; and where he had enjoyed the highest favour several years. His taste, governed by science, was correct and exquisite. His voice, though not of great volume, was sweet, clear, flexible, and extensive; being in compass more than two octaves. But he is supposed to have injured his cheek in early youth by a rage for counterpoint. He played the harpsichord neatly, accompanied well, and had real genius for composition, which inclined him to devote that time to the pen and the improvement of his hand, which, perhaps, in his ilation, would have been more usefully bestowed in nursing and exercising his voice.

It was some time before the extent of his merit and science were known in this country, and favoured by the public. Nothing can fo speedily convey the merits of a finger to an audience, as a great and powerful voice. However, his taste, fancy, knowledge, and delicacy, together with his beautiful person, and spirited and intellectual manner of acting, before the first feaon was over, gained him general approbation and favour. And since he has quitted the stage, and made Bath his residence. Though he has been long obliged to discontinue finging in public, it is not too much to say that he has dished as a taste throughout the kingdom, by the numerous scholars he has taught among the nobility and gentry, as well as by those whom he has prepared for public patronage, professedly.

RAW, in Agriculture, any sort of plant, sublimate, or material, which is in a green, unripe, or undigested condition, or which is employed in its more fresh and crude state; as, for instance, dung before it has been much reduced, and lost many of its nutrient principles or properties by the process of fermentation. See Dung.

RAW Cream, in Rural Economy, such as is raised in the natural way, not killed or clouted.

RAW Hide. See Hide.

RAW Lands, in Agriculture, a term applied to wet, cold, heavy lands, which are unfit to receive the seed.

RAW Silk. See Silk.

RAWA, or RAWA, in Geography, a town of the duchy of Warsaw, late capital of a patinate of the same name. The castle is appropriated for the confinement of state prisoners; 45 miles S.W. of Warsaw. N. lat. 51° 55'. E. long. 20° 17'.

RAWA, a town of Poland, in the patinate of Belz; 18 miles S.W. of Belz.

RAWA. See RAWA.

RAWAK, a small island in the Pacific ocean, near the N. coast of the island of Waygoo, with which it forms a harbour. E. long. 131° 15'.

RAWAPSKITCHWOCK, a small westerly branch of Machias river. See Machias.

RAWAY, or Bridge-town, a truly commercial village of Middlesex county, New Jersey, on Raway river, four or five miles S.W. of Elizabeth-town, and 75 from Philadelphia.
RAY

It contains a post-office, a presbyterian church, and about 50 or 60 houses.

RAWDON, a town of Nova Scotia, 40 miles from Halifax, containing about 50 or 60 houses.

RAWDON, a township of the county of Hants, in Upper Canada, N. of Sidney.

RAWLINSON, Christopher, in Biography, of Cork-Hall, in Lancashire, was born in 1677, educated in Queen's college, Oxford, and died in 1753; he was much attached to Saxon and Northern literature, and published an edition of “King Alfred's Translation of Boethius de Consolation,” 8vo. 1698.

RAWLINSON, Richard, a distant relation of the preceding, a learned antiquarian, was the son of Sir Thomas Rawlinson, knight, and once lord mayor of London. He was educated at St. John's college, Oxford, and was admitted to the degree of doctor of the civil law in 1719. He devoted himself to antiquarian pursuits, and made large collections for a continuation of Wood's Athenae Oxonienses, and History of Oxford, and published the life of that industrious antiquary. The principal work of Mr. Rawlinson was “The English Topographer,” or, An historical account of all the pieces that have been written relating to the ancient natural history or topographical description of any part of England, 1729. He published the “Latin Letters of Abelard and Heloïse,” and “A Translation of Du Fresnoy's New Method of Studying History,” 2 vols. 8vo. He died at Ilston in 1755; and by his will ordered that his heart should be deposited in the chapel of St. John's college, Oxford. That university was indebted to him for various benefactions of books, manuscripts, medals, &c. as well as landed property, and an endowment for an Anglo-Saxon lecturer.

RAWLLOW, in Geography, a town of Hindoostan, in Palnau; 27 miles W.S.W. of Timerycotta.

RAY, John, in Biography, whom Haller terms the greatest botanist in the memory of man, and to whose transcendent merits we have already briefly adverted, in treating of the genus dedicated by Plu-mer to his name, see RAJAMIA; was born at Black Notley, near Braintree, in Essex, Nov. 29, 1628. His father, Roger Ray, though in the humble lotation of a blacksmith, gave him a learned education; first at the grammar-school of his native town, at that time not very well conducted; and subsequently at Cambridge, where he entered at Catharine Hall, in his 16th year, June 28th, 1644, being designed for holy orders. In about a year and three quarters afterwards, he removed to Trinity College, where he found the young men occupied in a more liberal train of studies, with less of scholastic disputes and quibbles. Ray was fortunate in having for his tutor at Trinity, Dr. Duport, an eminent Greek scholar, under whose护照ing and partial care, he soon made up for all the deficiencies of his early education, in the learned languages, including Hebrew. By this gentleman he was always mentioned with peculiar regard. He was no less happy in a youthful literary friend and fellow-student, afterwards the celebrated Dr. Isaac Barrow. Even at this early period, Ray began to cultivate natural history; and distinguished himself by many school exercises as an orator, no less than by his general taste for study, his love of virtue, and his gentlemanly manners, qualities which shine brighter and brighter to the latest period of his life. His merit occasioned him to be chosen a Minor Fellow of Trinity, along with his friend Barrow, September 8th, 1649. On taking his degree of Master of Arts, he became a Major or Senior Fellow; and afterwards, October 18, 1651, Greek Lecturer of the college. At the end of two years he was appointed Mathematical Lecturer, and in two years more, October 2d, 1655, Humanity Reader. He subsequently filled several respectable offices in his college, as Junior Dean, College Steward, &c., and during his residence in the university, became tutor to many gentlemen of rank and fortune, who were sensible of their obligations to him; amongst whom the most eminently distinguished by personal worth, and congeniality of talents with himself, was Mr. Francis Willughby, of Middleton-hall in Warwickshire, so well known by his posthumous works on Birds and Fishes, edited by the affectionate care of Ray.

At this period it was usual for young men of ability and learning, though not in orders, to deliver sermons, and common-place readings, as they were called; not only in the chapels or halls of their own colleges, but even before the university body, at St. Mary's church. In these Ray eminently distinguished himself. He was among the first who ventured to lead the attention of his hearers, from the unprofitable subtleties of scholastic divinity, and the trammels of Arilotelian philosophy, to an observation of nature, and a practical investigation of truth. The rudiments of many of his subsequent writings originated in these juvenile effays, particularly his celebrated book on the “Wisdom of God manifested in the Works of the Creation,” known all over the world by its numerous editions and translations, and universally admired for its rational piety, found philosophy, and solid instruction. This book is the basis of all the labours of following divines, who have made the book of nature a commentary on the book of revelation; a confirmation of truths, which Nature has not authority, of herself, to establish. In it the author inculcates the doctrine of a constantly superintending Providence; as well as the advantage, and even the duty, of contemplating the works of God. This, he says, is part of the business of a sabbath day, as it will be, probably, of our employment through that eternal rest, of which the sabbath is a type. Archbishop Tenison is recorded to have told Dr. Derham, that “Mr. Ray was much celebrated, in his time, at Cambridge, for preaching solid and useful divinity, instead of that enthusiastical stuff, which the sermons of that time were generally filled with.” Two of his funeral discourses are mentioned with particular approbation; one on the death of Dr. Arrowsmith, master of his college; the other on that of one of his most intimate and beloved colleagues, Mr. John Nid, likewise a Senior Fellow of Trinity, who had a great share in Ray's first botanical publication, the “Catalogus Plantarum circa Cantabrigiam nataleum, printed in 1665;” which may be considered as the prototype of his Synopsis, hereafter mentioned. Indeed before this little volume appeared, its author had visited various parts of England and Wales, for the purpoze of investigating their native plants, as he did several times afterwards; nor were his observations confined to natural history, but extended to local and general history, antiquities, the arts, and all kinds of useful knowledge. His amusing Itineraries were published, along with his life, by Dr. Derham, and a few letters to that gentleman, by the care of Dr. George Scott, F.R.S., in 1670, under the title of “Select Remains of the learned John Ray, M.A., &c.” Ray's first botanical tour occupied nearly six weeks, from August 9th to September 18th, 1658. On the 23d of December 1663, he was ordained, both deacon and priest at the same time, by Dr. Sanderson, then bishop of Lincoln. In 1661 he travelled with Mr. Willughby into Scotland, returning by Cumberland and Weftmoreland; and the following year, with the same companion, he accomplished a more particular investigation of Wales. How critically he studied the botany of the countries
countries he visited, is evident from the different editions of his *Catalogus Plantarum Angliae*, and *Synopsis Methodica Stirpium Britannicarum*.

All this while Mr. Ray continued to enjoy his fellowship, and to cultivate his Cambridge connections; but in September 1662, his tranquility was disturbed by the too famous Bartholomew act, by which 2000 confessional divines were turned out of their living, and many fellows of colleges deprived of their maintenance, and means of literary improvement. Among the latter was the subject of our memoir, with thirteen honest men at Cambridge besides, of whose names he has left us a lift. One of them, Dr. Dillingham, was master of Emanuel college; but Ray was the only person of his own college who suffered this deprivation. The reader must not suppose that he, or perhaps any other person in this illustrious catalogue, was, in the least degree, deficient in attachment to the doctrine or discipline of the church of England, or that they had taken the oath called the Solemn League and Covenant; which Ray certainly had neither taken nor ever approved. They were required to swear to the infamous proposition, that the said oath was not binding to those who had taken it, and on this ground Sir Robert cautiously gave up their preferment. It is curious to read the apology made for Ray to Dr. Derham, on this subject, by a Mr. Brokeby — that he was at that time absent from his college, where he might have met with satisfaction to his feruples; and was among some zealous non-conformists, who too much influenced him, by the addition of new feruples. And we may also ascribe somewhat to the prejudice of education in unhappy times." By this it appears, that the "feruples" of non-conformists were most favourable to the sanctity of an oath; and that the "unhappy times" alluded to, were more advantageous to principle, than the golden days of Charles II.; whose ministers doubletely valued the obedience, far more than the honesty, of any man; nor is this tate, by any means, peculiar to them or their profligate master.

Mr. Ray, or, as he wrote his name, for a while, about this period, Wray, having thus the world before him, made an arrangement with Mr. Willughby for a tour on the continent; and in this plan two of his pupils were included, Mr. Nathaniel Bacon, and Mr., afterwards Sir Philip, Skippon. They failed for Calais in April 1663, but being prevented, by the state of political affairs, from prosecuting their journey through France, they traversed the Low Countries, Germany, &c. Proceeding by Venice into Italy; most of whose cities they visited, either by sea or land; as well as Malta and Sicily; and returned, by Switzerland, through France, into England, in the spring of 1666. Mr. Willughby indeed separated from the rest of the party at Montpelier, and visited Spain. An ample account of their observations was published by Ray, in 1673, making a thick octavo volume. The travellers appear to have been diligent and acute in every thing relative to politics, literature, natural history, mechanics, and philosophy, as well as antiquities and other curiosities; but in the fine arts they assume no authority, nor display any considerable taste or knowledge. Mr. Willughby's account of Spain makes a part by itself, and a rich critical catalogue of such plants, not, for the most part, natives of England, as were observed in this tour, concludes the volume. Haller gives to Ray the credit of having discovered several species in Switzerland, previously not known as natives of that country.

Ray palled the summer of 1666 partly at Black Notley, and partly in Sussex, studying chiefly the works of Hook, Boyle, Sydenham on Fevers, and the Philosophical Transactions, "making few discoveries," says he, "fave of mine own errors." The following winter he was employed at Mr. Willughby's, in arranging that gentleman's museum of natural history and coins, and in forming tables of plants and animals for the use of Dr. Wilkins, in his famous work on a Universal Character. He now also began to arrange a catalogue of the English native plants, which he himself had gathered; rather for his own use, than with any immediate view of publication; "at present," as he wrote to Dr. Lister, "the world is glutted with Dr. Merret's bungling Pindar. I resolve never to put out any thing which is not as perfect as is possible for me to make it. I wish you would take a little pains this summer about grafts, that so we might compare notes." The above resolution of our author is, no doubt, highly commendable, but the world has rather to lament that so many able men have formed the fame determination, at least in natural science. If it were universally adhered to, scarcely any work would see the light; for few can be so sensible of the defects of any other person's attempt to illustrate the works of nature, as a man of tolerable judgment must be of his own. This is especially the case with those who, like Ray, direct aspiring views towards, system, and philosophical theory. Happily for the world, Willughby was in the course of his life trained himself by wholesome practical discipline, in observation and experience. His first botanical works assumed the humble form of alphabetical catalogues. His and Mr. Willughby's labours in the service of bishop Wilkins, were indeed of a systematical description; and accordingly the authors themselves were, more than any other person probably, dissatisfied with their performance. They relaxed from these labours in a tour of practical observation through the west of England, as far as the Land's End, in the summer of 1667, and returning by London, Mr. Ray was invited to become a Fellow of the Royal Society, into which learned body he was admitted November 7th. Being now requested by his friend Wilkins to translate the "Real Character" into Latin, he undertook, and by degrees accomplished, that arduous performance, depositing his manuscript in the library of the Royal Society, where it has ever since reposed. The following summer was agreeably spent, in visits to various literary friends, and in a solitary journey to the north; for his former companion Willughby, being just married, layed at home; there Ray joined him in September 1668, and remained for most part of the ensuing winter and spring.

The felicities and leisure of the country, with the converse and affluence of such a friend, were favourable to the prosecution of a new subject of enquiry, which now strongly attracted the attention of our great naturalist, the theory of vegetation. The frist step of the two philosophers, in this little-explored path, was an examination of the motion of the sap in trees; and the result of their enquiries, communicated to the Royal Society, appeared soon after in the Philosophical Transactions. Their experiments clearly prove the ascent of the sap through the woody part of the tree; which is easily detected by boring the trunk, at different depths, before the leaves are unfolded; and they observed also the mucilaginous nature of the flowing sap, "precipitating a kind of white coagulum or jelly, which," says Ray, in a note preferred by Derham, "may be well conceived to be the part which, every year, between bark and tree, turns to wood, and of which the leaves and fruit are made. It seems to precipitate more when the tree is just ready to put out leaves, and begins to cease dropping, than at first bleeding." The accuracy of the leading facts recorded by these ingenious men, is confirmed by subsequent observers, who have further purified the same subject, which is now sufficiently
sufficiently well understood. They indeed, like the rest of the world till lately, seem not to have suspected, that the sap was quietest till their perforations in the tree were made; nor did they advert, as they ought, to phenomena dependent on the principle of life, in the vegetable body. See *Circulation of the Sap*.

At this time Ray began to prepare for the press his "Collection of Proverbs," a curious book in its way, by which he is perhaps better known to the generality of his countrymen, than by any other of his literary labours. The first edition was published in 1672; but the work was subfequently much enlarged, and the author may almost be said to have exhausted his subject. From its very nature, delicacy and refinement must often be dispensed with; but this is evidently not the fault, or the aim, of the writer. His learning and critical acuteness diffuse light over the whole, and make us overlook the coarse vehicle of our instruction.

The first edition of the Catalogue of English Plants, already mentioned, came out in 1670, and the second in 1677. Their great author gave his work to the world with that diffidence, for which he alone perhaps could perceive any just foundation. We pollute our remarks till we speak of the fame work in its systematic form hereafter.

About this period the health of Mr. Ray seems to have been considerably impaired. He refused a tempting offer to travel again on the continent, as tutor to three young noblemen; nor could the powerful attractions of alpine botany, which made a part of his prospect, overcome the reluctance to leaving home, which arose from a feeble state of body. Indeed this very reluctance, or little-steps, is accounted for, by the turn which his disorder took, as it terminated in the jaundice. After this depressing complaint had left him, he refrained, with fresh alacrity, his botanical travels at home, visiting the rich florists of the north of England, with a companion named Thomas Williscroft, whole name and discoveries he afterwards, on many occasions, has gratefully commemorated. Nothing forms a more striking feature in Ray's character, than the unrelished and abundant commendation, which he always gave to his friends and fellow-labourers. We are about to narrate an event, which called forth all his affectionate feelings of this kind, as well as his most important and beneficial exertions; when, even to this own prejudice, he fulfilled the sacred duties of friendship, and delighted in adorning the built of his friend with wreaths, that he himself might justly have assumed. On the 3d of July 1672, Mr. Williscroft was unexpectedly carried off by an acute disorder, in the 37th year of his age. The care of his two infant sons was confided by himself to Mr. Ray, who was also appointed one of his five executors, and to whom he left an annuity of 60l. for life. The eldest of these youths was created a baronet at the age of 10 years, but died before he was 20. Their father Cassandra afterwards married the duke of Chandos. Thomas, the younger son, was one of the ten peers created, all on the same day, by queen Anne, and received the title of lord Middleton. His early youth was much indebted to the care of his faithful guardian, who composed, for his and his brother's use, and published in 1672, a *Nomenclator Classicus*, far more exact, especially in the names of natural objects, than any that had previously appeared. The care of his pupils, and of the literary concerns of their deceased parent, now interrupted Mr. Ray's botanizing excursions, and caused him also to decline the offer of Dr. Liller, then a physician at York, to settle under his roof. Bishop Wilkins did not long survive Mr. Williscroft, and his death made another chasm in the scientific and social circle of our great natural philosopher, who felt these losses as deeply and tenderly as any man. He sought consolation in a domestic attachment, fixing his choice on a young woman, of good parentage, whose name was Margaret Oakeley, and who resided in the family at Middleton-hall. He was married at the parilh church, June 5th, 1673, being then in the 45th year of his age, and his bride about 20. This lady took a share in the early education of his pupils, as far as concerned their reading English. She is said to have been recommended by her character, as well as her person, to the regard of her husband. She bore him three daughters, who, with their mother, survived him.

Ray's communications to the Royal Society became now very frequent, and extended to various subjects relative to the natural history of animals, as well as to the physiology, and even the botanical characters, of vegetables. He was, at the same time, in the course of the years 1674 and 1675, much occupied in digesting Mr. Williscroft's zoological papers. Thes e were composed in Latin, in which language the Ornithology first appeared in 1676, making a full volume, accompanied by 77 plates, engraved, at the expense of the author's widow, from his own drawings. An English translation by Ray, with still more additions than he had supplied to the former publication, and one more plate, issued from the press in 1678. The account which Dr. Derham received from the lips of Mr. Ray, about eight months previous to his decease, respecting the primary intentions of himself and his late friend, and which is recorded in his life, p. 48, is too curious to be omitted here, as their project and its execution form an epocha in the history of natural science. "These two gentlemen," says Derham, "finding the history of Nature very imperfect, had agreed between themselves, before their travels beyond sea, to reduce the several tribes of things to a method; and to give accurate descriptions of the several species, from a strict view of them. And forasmuch as Mr. Williscroft's genius lay chiefly to Animals, therefore he undertook the Birds, Beasts, Fishes, and Insects, as Mr. Ray did the Vegetables.* Derham adds, that Mr. Williscroft, during his short life, "prosecuted his design with as great application, as if he had been to get his bread thereby." The writer of the present article has elsewhere observed, (Introductory Discourse, Tr. of Linn. Soc. v. 1.) that "from the affectionate care with which Ray has cherished the fame of his departed friend, we are in danger of attributing too much to Mr. Williscroft, and too little to himself." His own statement, no doubt, was correct, as to their original aims; but it is impossible not to perceive that the survivor executed or perfected what his friend, in many instances, could only have projected, or fearfully begun. Had Williscroft lived, there can be little doubt of his career being as glorious in the sequel as that of his friend; and possibly, from the advantages of fortune which he enjoyed, even more widely beneficial to science. Yet who can tell that he might not have thickened his course? Though he gloriously avoided the fames of luxury and folly in his youth, who shall say that politics or ambition might not have dazzled his riper age? or that he would always have escaped that ruinous vanity, which grasps at universal knowledge, or rather at universal fame; and knowing nothing deeply, is most flattered with any praise which is least deserved. So often has this last been the case with literary men, that one cannot but mildly regard a character of the fairest promise. What Ray has done, we know and can appreciate, Equal to his friend in learning, talents, and zeal, the advantages of ample fortune were compensated by the leisure and tranquillity of a sequestered country life. His duties went
Ray went hand in hand with his studies and recreations, and he enjoyed, as Haller observes, the rare felicity of giving 50 years uninterruptedly to his favourite science. His long-protrayed studies, and ripened experience, enabled him to achieve what at first he could but regard at a distance, as the great object of his wishes, a systematic arrangement of the animal as well as vegetable kingdoms. Every body had, hitherto, been content with Aristotle's classification of animals, of whose imperfections Ray, daring to think for himself, could not but be aware. He invented a new one, founded on the structure of the heart. "The Harvian experiments, and doctrine of the circulation, had called the peculiar attention of philosophers to every organ which has a share in that phenomenon; and to this cause, probably, we owe the method of Ray." The mode of breathing in animals, whether by lungs or by gills, and the single or double structure of the heart, in the former case, constitute the basis of his system; which, in these particulars at least, succeeding naturalists have adopted. His subordinate characters of the principal classes excite great skill and sagacity, and the Linnean system of Quadrupeds is highly indebted to that of our illustrious countryman.

His zoological publications indeed did not follow each other in rapid succession; for after the Ornithology had come forth in English, eight years elapsed before the Historia Pflanzen of Willughby was given, by his care, to the world. This was printed in folio, with 188 plates of figures, in 1686, at Oxford, owing to the interest of bishop Fell, and the pecuniary assistance of the Royal Society. It does not appear why the record of Mr. Willughby witheld, in this instance, the contributions which had to much benefited her husband's former work, and which she justly owed to his fame. It seems that the intimate connexion of Ray with this family, was much impaired by the death of lady Caffandra Willughby, the mother of his friend, about the year 1675 or 1676; when the children were taken from his tuition, and he left Middleton-hall, fixing for a short time at Sutton Coldfield, four miles distant. At Michaelmas 1677 he removed from thence to Falborne-hall, in Elysh, not far from his native village. On the 15th of March following, his mother, at the age of 78, died at Black Notley, "in her house on Dowlands," of whom he speaks with that reverence and regret, which has peculiarly marked the characters of some of the greatest and best men on the same occasion. At Midsummer 1679, he finally settled at Black Notley, for the remainder of his days, or "for the short pittance of time he had yet to live in this world," as he himself expressed it; which pittance, however, extended to more than twenty-five years.

The first fruit of our author's leisure and retirement was his Methodus Plantarum Nova, published in 1682, making an octavo volume. "His principles of arrangement are chiefly derived from the fruit. The regularity and irregularity of flowers, which take the lead in the systeim of Rovinius, make no part of that of Ray. It is remarkable that he adopts the ancient primary division of plants, into trees, shrubs, and herbs, and that he blamed Rovinius for abolishing it, though his own prefatory remarks tend to overfect that principle, as a vulgar and casual one, unworthy of a philosopher. That his system was not merely a commodious artificial aid to practical botany, but a philosophical clue to the labyrinth of Nature, he probably, like his fellow-labourers, for many years, in this department, believed; yet he was too modest, and too learned, to think he had brought this new and arduous design to perfection; for whatever he has incidentally or deliberately thrown out, respecting the value of his labours, is often marked with more difference on the subject of classification, than any other. He first applied his system to practical use in a general Historia Plantarum, of which the first volume, a thick folio, was published in 1686, and the second in 1687. The third volume of the same work, which is supplementary, came out in 1704. 'This vast and critical compilation is full in use as a book of reference, being particularly valuable as an epitome of the contents of various rare and expensive works, which ordinary libraries cannot pollute, such as the Historia Universalis. The defacement of species is faithful and instructive; the remarks original, bounded only by the whole circuit of the botanical learning of that day; nor are generic characters neglected, however vaguely they are assumed. Specific differences do not enter regularly into the author's plan, nor has he followed any uniform rules of nomenclature. So ample a transcript of the practical knowledge of such a botanist, cannot but be a treatise; yet it is now much neglected, few persons being learning enough to use it with facility, for want of figures, and a popular nomenclature; and those who are, seldom requiring its assistance. A mere catalogue or index, like the works of Tournefort and Calgar Btuthin, which teach nothing of themselves, are of lesser use. The Species Plantarum of Linnaeus unites the advantages of the clearest most concise specific definition, and, by the help of Btuthin, of an universal index.

But if the fame or the utility of Ray's great botanical work has, neither of them, been commensurate with the expectations that might have been formed, a little octavo volume, which he gave to the world in 1690, amply supplied all such defects, and proved the great corner stone of his reputation in this department of science. We speak of the Synopsia Methodica Stirpium Britannicarum. The two editions of his alphabetical catalogue of English plants being fold, and some pettifogging reasons of his book-feller's standing in the way of a third, with any improvements, he re-modelled the work, throwing it into a systematic form, reviving the whole, supplying generic characters, with numerous additions of species, and various emendations and remarks. The uses and medicinal qualities of the plants are removed to the alphabetical index at the end. A second edition of this Synopsia was published in 1696, nor did its author ever prepare another. The third, now molder in use, was edited twenty-eight years afterwards by Dilhensius. (See that biographical article.) Of all the systematical and practical Floras of any country, the second edition of Ray's Synopsia is the most perfect that ever came under our observation. He examined every plant recorded in his work, and even gathered molder of them himself. He investigated their synonyms with consummate accuracy; and if the clearness and precision of other authors had equalled his, he would scarcely have committed an error. It is difficult to find him in a milakle or misconception respecting Nature herself, though he sometimes misapprehends the bad figures, or lame descriptions, he was obliged to consult. 'The of Linne. Sec. c. 4. 277. Above 1500 species are added, in this second edition, and the cryptogamic plants, in particular, are more amply elucidated. A controversial letter from Rovinius to Ray, and its answer, with remarks upon Tournefort, are subjoined to this second edition. Much of the dispute turns upon the now obsolete distinction of plants, in a methodical system, into trees, shrubs, and herbs, &c. The letters are well written, in Latin: and liberal, though perhaps hypercritical, in their style. Ray took no delight in controversy. Its inevitable
evitable asperities were foreign to his nature. We must not omit to notice that, in the preface to both editions of his *Synopsis* of the learned author, venerable for his character, his talents, and his profession, as well as by his noble adherence to principle in the most corrupt times, has taken occasion to congratulate his country, and to pour out his grateful effusions to Divine Providence, in a style worthy of Milton, for the establishment of religion, law, and liberty, by the revolution which placed King William on the throne. An honest Englishman, however retired in his habits and his pursuits, could not have withheld this tribute at such a time; nor was any loyalty ever more personally disinterested than that of Ray.

The year 1690 was the date of the first publication of his noble work on "The Wisdom of God in the Creation," of which we have already spoken, and whose sale, through many editions, was very extensive. In 1700 he printed a book, more exclusively within the sphere of his sacred profession, called "A Persuasive to an Holy Life;" a rare performance of the kind, at that day, as it would be at the present; but being devoted to enthusiasm, mysticism, or cant, as well as of religious bigotry or党的 spirit, and employing the plain and solid arguments of reason, for the benefit of purposes." His three "Physico-Theological Discourses, concerning the Chaos, Deluge, and Disolution of the World," of which the original materials had been collected and prepared formerly at Cambridge, came out in 1692, and were reprinted the following year. A third edition, superintended by Derham, was published in 1713. This able editor took up the same subject himself in a similar performance, the materials of which, like Ray's, were first delivered in sermons, at Bow church, he having been appointed reader of Mr. Boyle's lectures.

While Ray was from time to time intent on these moral and religious performances, in which he laboured equally to impress and elucidate the truths of natural and revealed religion, as well as to enforce its precepts and duties, he was no less attentive than formerly to his systematical studies. Dr. Tancred Robinson is recorded by Derham, as having first prompted our great naturalist to undertake a *Synopsis* Methodica, or checkly arrangement, of the whole animal, as he had done of the vegetable, kingdom. He even wished him to extend his attention to fossils, anticipating, in short, what Linnaeus afterwards performed. Nor did he think from the talk. Though now for some time oppressed with bodily infirmity, and particularly with very troublesome ulcers in his legs, his mind was tranquil and unimpaired. He soon finished his *Synopsis Methodica Animalium Quadrupedum et Serpentina Generis*, which came out in 1693, making a thin, but closely printed, octavo volume. We have already spoken of the originality of his method. The volume in question, however, is not confined to dry systematical arrangement. It enters deeply into the general and particular history of animals, their external forms, and internal structure, with abundance of entertaining and curious facts and observations. Linnaeus was so pleased of this book from the year 1734, and appears to have studied it well. A similar volume on birds, and another on fishes, were prepared by the author; but the manuscripts of these lay neglected in the hands of some careless or ignorant book-seller, till they were discovered by Dr. Derham, and published in 1713. They contain more of particular descriptions and histories, than of general remarks; but otherwise accord with the plan of the *Synopsis* of Quadrupeds. Many things are supplied from materials obtained since the publication of Willughby's *Ornithology* and Ichthyology, and several figures of fishes were added by Derham, at the persuasion of Petiver, whose works they somewhat resemble. Having accomplished so many great and laborious publications, our venerable naturalist began, as Dr. Derham informs us, to enjoy the thoughts of repoling from his labours. He was nevertheless ready, at the call of his friends, to revile a translation of Rauwolf's Travels, the original having even then become very scarce, besides being unintelligible to mere English readers. This translation, with some other rare tracts annexed, and a catalogue of Greek, Syrian, Egyptian, and Cretan plants, drawn up by Mr. Ray, illumed from the press in 1693. See Rauwolf.

Possibly the *Stirpium Europaeorum extra Britannias nascientes Syllae*, which appeared in 1694, originated in the author's attention being recalled, by the last-mentioned publication, to the contemplation of exotic plants. In this volume he collects from Clusius, Bauhin, Colonna, and others, various additions to his own discoveries, and the whole are disposed in alphabetical order. A geographical arrangement of the plants, which he had himself gathered in his foreign travels, is founded; and the volume concludes with alphabetical catalogues, selected from Boccone's Sicilian plants, and other recent authors. It is in the preface to this book, that he first adverts to the fyxlem of Rivinlus, not without just applauses of that author's work, a copy of which had been presented to Ray. He commends the apt distribution of the genera, the clearness and conciseness of the fylfe, the purity of the Latin, and the beauty as well as exactness of the plates. He, however, contends for the ancient distinction of plants into trees and herbs, which, as we have seen, he had himself mentioned as unphilosophical. In the rest of his criticisms, though much may be said on both sides, and though these controversy like others, profit of the intricacies and anomalies of Nature, to make good their arguments, concealing themselves, like the cuttlefish, in their ink; still we cannot but give our testimony to the greater solidity of Ray's principles, as derived from the fruits and seeds of plants, than to the seemingly more elegant ones of Rivinlus, deduced from the flower; which faith undoubtedly lead, in their practical application, to some paradoxical combinations. But on this subject we may say more in its proper place. (See Rivinus.) In this preface Ray points out the importance and use of the flaments and piliils, facetiously explaining the sexual doctrine, as now universally admitted.

One advantage arose from the epistolary alteration of Rivinus and Ray, that it led the latter to revile his own system, and to republish it, in an improved state. Happy if such were more generally the fruit of contention, that each party should correct himself, instead of aggravating the defects of his adversary. Some notice is taken, in the preface to this edition, both of the system of Tournefort and that of Hermann, which last was most congenial to the principles of Ray. The work was finished in 1698, but not given to the public till 1703, recourse having been had to a Dutch bookseller, who thought it for his interest to place an English publisher's name in the title-page; a proceeding which, however harmless, shocked the honest feelings of the author; and this perhaps excited the thrifty Hollander's fuiprize. By his exertions, however, the book, and the fame of his author, became more widely diffused, and continental botanists were much further initiated into Ray's system than they had previously been.

But now the mortal career of this eminent man was drawing towards a close. He complained in his letters, that so far from being able to visit the London gardens, as he wished,
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William Coyte, M.A., father of the late Dr. CoYTE of Ipswich, and the original manuscript is now before us, containing the information that Ray was interred in the church-yard. In 1737, the monument in question, which seems to have been a foot of altar tomb, being nearly ruined, was reflored at the charge of Dr. Legge, and removed for shelter into the church; where therefore it became a centograph as an inscription added on this occasion terms it. Forty-five years afterwards the tomb again underwent a repair, by the care of the present Sir Thomas Gerry Cullum and others, who subjoined a third inscription, as follows:

Tumulum hunc, a nonnullis humanitati, et scientiae naturali, faveaturhus, ohim conditum, et aliorum boni diligentiae poletam redditurum, 1737, nume e vetustatis fine et foribus paxci de novo revocantur, 1792.

A more laffing monument was dedicated to the memory of our great English naturalist, in the genus of plants which bears his name. (See RALANIA.) The opinion we have there, in few words expressed, of his high rank in botanical science, it is hoped the present more diffuse account will justify. It must be lamented that he made, as far as we can learn, no collection of dried plants, which might serve to ascertain, in every case, what he described. The great Herbariums of Buckle, Uvedale, &c. still kept in the British Museum, are indeed supposed to supply, in a great measure, this defect; they having been collected by persons who had frequent communication with Ray, and were well acquainted with his plants. Whatever he had preferred relative to any branch of natural history, he gave, a week before his death, to his neighbour Mr. Samuel Dale, author of the Pharmacologia. Nothing is said of his library, which was probably considerable. His pecuniary circumstances were very limited, for he merely conformed as a layman to the church of England, and was unwilling to subscribe what was requisite for receiving prebend. He is recorded nevertheless to have disapproved of separatists from the national church; justly disgusted, probably, by the contentions and fanaticism he had seen throughout the greater part of his life. His principles and feelings feared far above the foolish distinctions, which marked the orthodox or the heterodox of those times, and his mind was uncontaminated with their passions. His good sense might well lead him to regret, that those who had so lately escaped a most tremendous common enemy, should be so prone to quarrel amongst themselves. It is an honour to both these parties that they have been emulous to claim him as their ally.

In the preceding review of the literary productions of Ray, more numerous, as Haller says, than those of any other botanist, Linnæus excepted, we have been obliged to pass over several things of lefs note; such as his lists of native British plants, for Gibbon's edition of Camden's Britannia; and even a variety of communications to the Royal Society. Neither have we touched on the principles of his botanical system, that subject being explained at length by our predecessor, the late Rev. Mr. Wood, under the article Classification. Those who are anxious to peruse a more full and critical investigation of his works and studies, than it has been possible to give in this place, will do well to consult Dr. Pulteney's "Sketches of the Progress of Botany in England." The "Philosophical Letters," collected and published in 1718, by Dr. Derham, containing 68 written by Ray, and many
RAY

many more by his correspondents, throw much light on his character and pursuits. We cannot help remarking that this hand-writing was peculiarly fair and elegant. A specimen of it exists among Sir Henry Spelman's valut and curious collection of manuscripts, now in the possession of John Patterson, esq. late M. P. for Norwich.

The portraits of Ray are not numerous. One in oil, taken at an advanced period of his life, remains in the British Museum, and Dr. John Sins is pollied of a miniature, of an earlier date, of which its owner has given an engraving, by way of frontispiece to the first volume of the "Annals of Botany," published in 1805. The latter is rather deficient in that strength of character which appears in the more common prints, after a picture by Faithorne, often prefixed to the third edition of the Synopsis, and sometimes to the Historia Plantarum. One of these prints was engraved by Elder; the other by Vertue. Neither of them is strictly appropriated to any particular hook. That in the German edition of his "Wisdom of God in the Creation," published at Leipsic in 1732, appears to be copied from one of thefe, and yet is so unlike them in expression, that if it were possible, one would suppose it taken from some other portrait of the fame perfon. Ray's Works. His Life by Dr. Derham. Haller's Bibl. Bot. Pulteney's Sketches. Akin's General Biography. S.

RAY, in Geography, a town of France, in the department of the Upper Saone; 12 miles E. of Champlite.

RAY, in Geometry. See Radius.

RAY, Radius, in Optics, a beam or line of light, propagated from a radiant point, through any medium.

Sir Isaac Newton defines rays to be the least parts of light, whether visible in the fame line, or contemporary in several lines.

For, that light consists of parts of both kinds, appears hence, that one may ftep what comes this moment in any point, and let pafs that which comes the next; and again, one may ftep what comes in this point, and let pafs that in the next. Now, the least light, or part of light, which may be thus ftepped alone, he calls a ray of light.

A ray of light is, therefore, confidered as an infinitely narrow portion, or an evanescent element of a fream of light; and a pencil, as a small detached fream, compofed of a collection of fuch rays accompanying each other. As we cannot exhibit to the fenes a fingle mathematical expefion, except as the boundary of two furfaces; in the fame manner, we cannot exhibit a fingle fream of light, except as the confine between light and darkmess, or as the lateral limit of a pencil of light.

If the parts of a ray of light do all lie straight between the radiant and the eye, which is the cafe when it moves through the fame uniform fubfance or a vacuum, called a medium, the ray is faid to be direct: the laws and properties of which make the fubjeet of optics. If any of them be turned out of that direfion, or bent in their paffage, the ray is faid to be refracted: and that branch of optics which treats of thefes refracted rays, is called dioptries; which fee. See also Refraction.

If it strike on the furface, or medium attached to the furface, of any body, and be driven back, it is faid to be reflected: and that branch of optics which treats of thefes refracted rays, is called cateoptics; which fee. See also Reflection.

In each cafe, the ray, as it falls either directly on the eye, or on the point of reflection, or of refraction, is faid to be incident: and the angle which the incident ray makes with the perpendicular to the reflecting surface at the point of incidenfe, is called the angle of incidence; and the angle which the refracted ray makes with the fame perpendicular, is called the angle of refraction; and alfo, the angle which the refracted ray makes with a perpendicular to the refracting surface produced, is called the angle of refraction.

Again, if feveral rays be propagated from the radiant equidiftantly from one another, they are called parallel rays. If they come inclining towards each other, they are called converging rays. And if they go continually receding from each other, they are called diverging rays.

It is evident that the rays of light, which come from a luminous point, must fall divergingly upon any given surface; yet when the object is very diftant, compared with the interval that separates these rays, the divergency of the rays becomes infensible; hence the rays of the sun, of the moon, of the stars, &c. are deemed parallel rays. When the luminous point is near, then the rays are fensibly diverging.

It is from the various circumstances of rays, that the fveral kinds of bodies are diftinguished in optics. A body, e. g. that diffuses its own light, or emits rays of its own, is called a body. If it only refects rays which it receives from another, it is called an illuminated body.

This definition, however, is not always obferved; for a luminous body, in common language, means any visible object, whether it be visible by the emifion of original light, like the sun, a candle, &c. or by reflected light, like the moon, or any other celestial or terrestrial object that has no native light, or that does not emit its own light.

If an object only transmit rays, it is called a transparent body. So that transparent bodies, such as water, glafs, &c. are thofe through which light will pafs, or through which our eyes can perceive objects situated on the other fide, and alfo bodies, as alfo a vacuum, are denomminated mediums in optics.

If it intercepts the rays, or refufe them paffage, fo that nothing can be feeen through it, it is called an opaque body.

Hence no body radiates, i. e. emits rays, unlefs it be either luminous, or illuminated.

It is by means of rays reflected from the feveral points of illuminated objects to the eye, that they become visible, and that vision is performed; whence fuch rays are called visual rays.

When an eye views any object directly, fome of the rays, which proceed from every perceivable point of the object, enter the eye, and the whole number of rays, or quantity of light, which thus enters the eye, is circumfcribed by the rays which proceed from the extreme points of the object: and the angle which these extreme rays from at the eye is called the visual angle, from the magnitude of which we principally judge of the distance of a known object. Thus, if the fame object is represented at different distances, it is evident that the farther the object is from the eye, the smaller will the visual angle be. Supposing also the distance between the eye and the object to remain the fame, if by any means the rays of light are bent fo as to enlarge the visual angle, then the object will appear larger, or it is faid to be magnified; and on the contrary, if the visual angle be diminished, then the object will appear smaller, in which cafe it is faid to be diminished.

In effect, we find that any point of an object is seen in all places to which a right line may be drawn from that point; but it is allowed, nothing can be seen without light; therefore every point of an object diffuses innumerable rays every way. Again, from other experiments it appears, that the images of all objects, whence right lines may be drawn to the
The eye, as painted in the eye, behind the crystalline, very small, but very distinct.

And lastly, from other experiments, that each ray produces an image of the radiating point: and that the several rays emitted from the same point are again united in one point, by the crystalline, and other humours of the eye, and thus thrown on the retina.

It is the spiffitude or clofenefs of the rays emitted from a luminous body, that constitutes the intenfenes of the light. Yet the direction in which the rays strike the eye, has a considerable influence. In effect, a perpendicular ray, striking with more force than an oblique one, in the ratio of the whole line to the fide of the angle of obliquity (as follows from the laws of refraction, which see), a perpendicular ray will affect the eye more vividly than an oblique one, in that ratio.

If then the spiffitude of the rays be equal, the intenfity will be as the direction; if the direction be the fame, the intenfenes will be as the spiffitude: if both differ, the intenfenes will be in a ratio compounded of the direction and the spiffitude.

Hence, first, if light be propagated in parallel rays through an unrefiiling medium, its intenfity will not be varied by dilance.

Secondly, if light be propagated in diverging rays through an unrefiiling medium, its intenfity will decrease in a duplicate ratio of the distances from the radiant point, reciprocally.

Thirdly, if light be propagated in converging rays through an unrefiiling medium; its intenfity will increase in a duplicate ratio of the distances from the point of concourse, reciprocally.

Fourthly, if the breadth of an illuminated plane be to the distance of the radiant point as 1 to 2,000,000, it is the fame thing as if the ray struck upon it parallel; and hence, since the diameter of the pupil of the eye, when large, fearcely exceeds 8th or 10th of an inch; the rays will fall upon it parallel as to lefle, at the distance of 3860 English feet, which is nearly fix furlongs. See Light.

The effect of concave lefles, and convex mirrors, is to make parallel rays diverge; converging rays become parallel; and diverging rays to become more divergent.

The effect of convex lefles, and concave mirrors, is to make diverging rays become parallel; parallel rays become convergent; and converging rays to converge the more. See Lenses.

The rays of light are not homogeneous, or similar, but differ in all the properties with which we are acquainted; viz. refrangibility, refle&ibility, and colour.

It is probable that from the different refrangibility the other differences have their rife; at leat it appears, that those rays which agree or differ in this, do fo in all the reft. Thus, from the different fentiments the differently difpofed rays excite in us, we call them red rays, yellow rays, &c.

The effect of the prin is to separate and fort the different kinds of rays, which come blended promifcuoufly from the fun; and to throw each kind by itself, according to its degree of refrangibility and colour, red to red, blue to blue, &c.

Besides refrangibility, and the other properties of the rays of light already ascertained by observation and experiment, sir Ifaac Newton fupposes they may have many more; particularly, a power of being inflected, or bent, by the action of distant bodies: and those rays which differ in refrangibility, he conceives likewife to differ in this refle&ibility.

In paffing by the edges and sides of bodies, he conceives that the rays may be bent several times backwards and forwards, with a motion like that of an ell; and that those rays which appear to fall on bodies are reflected or refracted before they arrive at the bodies: and adds, that they may be reflected, reflected, and inflected, all by the fame principle acting in different circumftances. See Reflection and Light. See also Reflection and Refraction.

Again, do not the rays, falling on the bottom of the eye, excite vibrations in the retina; which, being propagated along the fibres of the optic nerve into the brain, cause vision? and do not several forts of rays make vibrations of several bignefses, which excite fentiments of several colours, much after the manner as the vibrations of the air, according to their several bignefses, excite fentiments of several sounds?

Particularly, do not the moft refrangible rays excite the fhortest vibrations, to make a fentiment of a deep violet; and the leaft refrangible the largelf, to make a fentiment of a deep red? and the feveral intermediate kinds of rays, vibrations of intermediate bignefses, to make fentiments of the intermediate colours?

And may not the harmony and difcord of colours arise from the proportion of these vibrations; as thofe of longt depend on the vibrations of the air; for fome colours, if viewed together, are agreeable, as gold and indigo; others difagreeable. See Colour.

Again, have not the rays of light feveral fides ended with feveral original properties? It is certain we find, that every ray of light has two oppofite fides, originally ended with a property, on which the unufual refraction of illand cryftal depends, and other two oppofite fides ended with that property.

Laftly, are not the rays of light very small bodies emitted from fiihing fubfances?

Such bodies may have all the conditions of light: and there is that action and reaction between transparent bodies and light, which very much refigures the attractive force between other bodies. Nothing more is required for the production of all the various colours, and all the degrees of refrangibility, but that the rays of light be bodies of different fizes; the leaf of which may make violet the weakfet, and darkelf of the colours, and be the moft easily difturbed by refraction from its refilinear courfe; and the reft as they are bigger and bigger, may make the ftronger and more lucid colours, blue, green, yellow, and red. (See Colour and Light.) Nor is any thing more requisite for the putting of the rays into fits of easy refle&ion, and easy tranfmi&ion, than that they may be small bodies, which, by attraction, or some other force, excite vibrations in the bodies they act upon; which vibrations, being twifter than the rays, overtake them successively, and agitate them fo as by degrees to increafe and diminish their velocity, and thereby put them into thofe fits. Laftly, the unufual refraction of illand cryftal appears very much as if it were performed by fome attractive virtue lodged in certain fides both of the rays, and of the cryftal.

Rays of Heat denote separate portions of that emanation, which proceeds from an heated body, when placed in a colder temperature, and which expands itself in every direction, provided it be not prevented by the interposition of particular fubfances. This appellation is adopted and thus applied, not becaufe that emanation is certainly known to consist of separate streams, but merely for the convenience of explanation. The rays of heat are not the fame with the rays of light. If this were the fale, a certain quantity of
of heat ought to be accompanied with the same quantity of light; whereas it is found, that several substances emit a considerable quantity of light without any sensible heat, and others give out a considerable portion of heat without any light. But that there are two distinct powers of nature is a proposition, that has been amply illustrated, and most satisfactorily established by the discoveries and experiments of Dr. Herschel. This celebrated astronomer cautioneth those, who peruse the account of his experiments and observations upon them, from concluding, that in using the word rays, he means to oppose, much less to countenance, the opinion of those philosophers, who still believe, that light itself comes to us from the sun, not by rays, but by the supposed vibration of an elastic ether, every where diffused through space: he merely claims the fame privilege for the rays that occur in heat, which they do not scruple to allow to those that illuminate objects. For in what manner forever this radiance may be affected, he undertakes to prove, that the evidence, either for rays, or for vibrations, which occasion heat, stands on the same foundation on which the radiance of the illuminating principle, light, is built.

Proposing to give a comparative view of the operations that may be performed on the rays that occasion heat, and of those which are known to have been effected on the rays that occasion light, he selects such facts as are well known with regard to the latter. Light, he says, both solar and terrestrial, is a sensation occasioned by rays emanating from luminous bodies, which have a power of illuminating objects; and, according to circumstances, of making them to appear of various colours. The rays of light are subject to the laws both of reflection and of refraction; but they are of different refrangibility. They are liable to be stopped in certain proportions, when transmitted through diaphanous bodies; and also to be scattered on rough surfaces. They are also supposed to have a power of heating bodies; but this is a subject "sub judice." The similar propositions, which it is his design to prove, and which by a variety of curious and well-conducted experiments he has confirmed, are such as follow. Heat, both solar and terrestrial, is a sensation occasioned by rays emanating from compound substances, which have a power of heating bodies. These rays are subject to the laws of reflection and of refraction; and they are of different refrangibility. They are liable to be stopped in certain proportions, when transmitted through diaphanous bodies; and also to be scattered on rough surfaces; and in a certain state of energy, they may be supposed to have a power of illuminating objects, which latter property remains to be examined.

In the examination of the illuminating and heating power of the prismatic colours, our author observes, that the red-making rays are very far from having the former in an eminent degree: the orange surpasses more of it than the red; and the yellow rays illuminate objects still more perfectly. The maximum of illumination lies in the brightest yellow, or palest green. The green itself is nearly equally bright with the yellow: but from the full deep green, the illuminating power decreases very sensibly; that of the blue is nearly upon a par with that of the red; the indigo has much less than the blue; and the violet is very deficient. Our author infers from other experiments, that the heating power of the prismatic colours is very far from being equally distributed; and that the red rays are chiefly eminent in this respect. Allowing that the power of heating is chiefly lodged in the red-making rays, it accounts for the comfortable warmth that is thrown out from a fire, when it is in the state of a red glow, and for the heat which is given by charcoal, coke, and balls of small coal mixed up with clay, used in hot-houses; all which throw out red light. It also explains the reason, why the yellow, green, blue, and purple flames of burning spirits mixed with salt, occasion so little heat that a hand is not materially injured, when passed through their corruptions.

Having ascertained, that radiant heat is subject not only to the laws of refraction, but to those also of the different refrangibility of light, Dr. Herschel is led to surmise, that this heat consists of particles of light of a certain range of moments, which range may extend a little farther, on each side of refrangibility, than that of light. In a gradual exposure of the thermometer to the rays of the prismatic spectrum, beginning from the violet, he found that he arrived at the maximum of light long before he came to that of heat, which lies at the other extreme. By several experiments, it appears, that the maximum of illumination has little more than half the heat of the full red rays; and from other experiments our author concludes, that the full red falls still short of the maximum of heat, which perhaps lies even a little beyond visible refraction. In this case, radiant heat will at least partly, if not chiefly, consist, if the expression may be allowed, of invisible light, that is, of rays coming from the sun, that have such a momentum as to be unit for vision. Admitting it as highly probable, that the organs of light are only adapted to receive impressions from particles of a certain momentum, this will explain why the maximum of illumination should be in the middle of the refrangible rays, as those which have greater or less momenta, are likely to become equally unfit for impressions of light. Whereas, in radiant heat, there may be no such limitation to the momentum of its particles. From the powerful effects of a burning lens, however, we derive information, that the momentum of terrestrial radiant heat is not likely to exceed that of the sun; and that, consequently, the refrangibility of caloric rays cannot extend much beyond that of coloured light. Hence we may also infer, that the invisible heat of red-hot iron, gradually cooled till it ceases to shine, has the momentum of the invisible rays, which, in the solar spectrum viewed by daylight, go to the confines of red, and this will afford an easy solution of the reflection of invisible heat by concave mirrors.

Our author deduces from various experiments with the thermometer abundant evidence, that there are rays coming from the sun, which are less refrangible than any of those that affect the light. They are invested with a high power of heating bodies, but with none of illuminating objects; and on this account they have hitherto escaped notice. At the distance of fifty-two inches from the prism, there was still a considerable heating power exerted by the invisible rays, an inch and a half beyond the red ones, measured upon their projection on a horizontal plane. Moreover, the power of heating is extended to the utmost limits of the visible violet rays, but not beyond them; and it is gradually impaired, as the rays become more refrangible. The maximum of this heating power is found to be vested among the invisible rays, and it is probably not less than half an inch beyond the last visible ones. It is also shown, that the sun's invisible rays, in their least refrangible state, and considerably beyond the maximum, still exert a heating power fully equal to that of red-coloured light; and consequently, if we may infer the quantity of the efficient from the effect produced, the invisible rays of the sun probably far exceed the visible ones in number. The general conclusion with which Dr. Herschel closes his account of one series of
of experiments and his reasoning upon them, is in the following manner: "If," says he, "we call light those rays which illuminate objects, and radiant heat, those which heat bodies, it may be inquired whether light be essentially different from radiant heat? In answer to which I would suggest, that we are not allowed by the rules of philosophy to admit two different causes to explain certain effects, if they may be accounted for by one. A beam of radiant heat emanating from the sun, confits of rays that are differently refrangible. The range of their extent, when diffused by a prism, begins at violet-coloured light, where they are most refracted, and have the heat efficacy. We have traced these calorific rays throughout the whole extent of the prismatic spectrum, and found their power increasing, while their refrangibility was lessened, as far as to the confines of red-coloured light. But their diminishing refrangibility, and increasing power, did not stop here: for we have pursued them a considerable way beyond the prismatic spectrum into an invisible state, still exerting their increasing energy, with a decrease of refrangibility up to the maximum of their power; and have also traced them to that state, where, though still less refracted, their energy, on account, we may suppose, of their now falling density, decreased pretty fast; after which the invisible thermometrical spectrum, if I may call it, soon vanished."—If this," continues our author, "be a true account of solar heat, for the support of which I appeal to my experiments, it remains only for us to admit, that each of the rays of the sun as have the refrangibility of those which are contained in the prismatic spectrum, by the construction of the organs of sight, are admitted, under the appearance of light and colour; and that the red, being stopped in the coats and humours of the eye, acts upon them, as they are known to do upon all other parts of our body, by occasioning a sensaion of heat."

Although, as we have above stated, the rays of light and those of heat, posses many similar properties, yet Dr. Herschel has shewn, that there are some striking and substantial differences between them. The rays of heat are of a much more extensive refrangibility than those of light, as our author has clearly and incontrovertibly demonstrated both by reasoning and experiment: nor do these rays agree either in their mean refrangibility, nor in the situation of their maxima. Where we have most light, there is but little heat, and where we have most heat, we find no light at all. (See Refrangibility.) It is found, that the lines of refraction of the heat-making rays are in a constant ratio to the lines of incidence; but that the focus of the rays of heat in burning glasses is different from the focus of the rays of light; that of heat being farther removed from the lens than the focus of light, probably not less than a quarter of an inch: the heat at half an inch beyond the focus of light being still equal to that in the focus. Although light and heat are both refrangible, the ratio of the lines of incidence and refraction of the mean rays is not the same in both. Heat is evidently less refrangible than light. From experiments relating to the transmission of light and heat through diaphanous bodies it appears, that no kind of regularity takes place in the proportion of rays of one sort and of another, which are stopped in their passage. Heat and light seem to be entirely unconnected, and the rays that occasion them are different. We have several tables, formed from the author's experiments, and shewing the quantities of light and heat intercepted by different substances. The blueish-white and flint-glasses, e. gr. stop nearly three times as much heat as light, whereas the greenish crown glasses stop only about one-fourth more of the former than of the latter.

From a table exhibiting the effects of coloured glasses, it appears, that a yellow glass stops only 335 rays of heat, but stops 819 of light; on the contrary, a pale blue stops 812 rays of heat, and but 634 of light. Again, a dark blue glass stops only 362 rays of heat, but intercepts 801 of light; and a dark red glass stops no more than 606 rays of heat, and yet intercepts nearly all the light, fearfully one ray out of 5000 being able to make its way through it. For the conclusions deduced from these tables, as they evince the non-identity of the rays of heat and those of light, and for the tables themselves, we must refer to the author's own paper, ubi infra. We are restrained by our limits from pursuing this curious subject, and from entering upon a detail of Dr. Herschel's experiments, illustrating and confirming principles, the discovery of which must be allowed to be one of the greatest that has been made since the days of Newton, although the theories of some speculative philosophers might have led to it a few years earlier. Dr. Herschel was occupied in determining the properties of various kinds of coloured glasses, which rendered them more or less fit for enabling the eye to view the sun through a telescope; and for this purpose it was necessary to inquire which of the rays would furnish the greatest quantity of light, without subjecting the eye to the inconvenience of unnecessary heat. He first observed that the heat became more and more considerable as the thermometer approached the extreme red rays in the prismatic spectrum; and pursuing the experiment, he found not only that the heat continued beyond the visible spectrum, but that it was even more intense where the thermometer was at a little distance without the limits of the spectrum, than in any point within it: as we have already stated. For Dr. Herschel's communications to the Royal Society on this subject, we refer to the 90th volume of the Philosophical Transactions for the year 1800, part ii. p. 255, &c. p. 284, &c. p. 293, &c. part iii. p. 437, &c.

Sir Henry Englefield has repeated Dr. Herschel's experiments with many precautions, and Mr. (Sir H.) Davy was a witness of their perfect accuracy. The excess of heat beyond the spectrum was even considerable enough to be ascertained by the sense of warmth occasioned by feeling it on the hand. It was first observed in Germany by Ritter, and soon afterwards in England by Dr. Wolfallon, that the muriate of silver is blackened by invisible rays, which extend beyond the prismatic spectrum, on the violet side. It is therefore probable, that these black or invisible rays, the violet, blue, green, perhaps the yellow, and the red rays of light, and the rays of invisible heat, constitute several different degrees of the same force, distinguished from each other into this limited number, not by natural divisions, but by their effects on our senses; and we may also conclude that there is some familiar relation between heated and luminous bodies of different kinds. See Young's Phil. Lect. vol. i. p. 639. See Heat and Refraction.

M. Delaroche has found, that the rays of invisible heat traverse glasses with difficulty at a temperature below that of boiling water; but that they traverse it with a facility, always increasing with the temperature, as it approaches the point when bodies become luminous, and from these experiments it would appear, that the modification, whatever it be, which must be impressed upon the invisible rays to render them more and more capable of passing through glass, makes them approach more and more to the state in which they must be when they penetrate our eyes, and occasion the sensation of vision. The same ingenious philosopher has likewise found, that the rays of heat which have passed through
through a plate of glass are proportionably more adapted to pass through a second plate; and from this circumstance we deduce a new proof of the peculiar state of these rays, and of the modification which they acquire. Mehrs. Gay-Lussac and Thenard have proved that all the changes of colour produced by light may be imitated and produced by heat, and by an elevation of temperature not exceeding 312°. Other phenomena previously observed indicated, that in the comparison of the actions of heat and light in heating bodies, or producing chemical changes in them, there is a great difference in the rays of different colours. M. Rochon announced the fact amply confirmed by Dr. Herschel, that the heat produced by the different rays of the prismatic spectrum was unequal. As Dr. Herschel fixed the maximum effect beyond the red rays, and theed, as we have already stated, that the most heating rays of the spectrum were entirely, or nearly, invisible; Dr. Wollaston, and Miers. Ritter and Beckmann, having examined the opposite, or violet end of the spectrum, found that this likewise produced peculiar properties, and that, beyond the violet, there are invisible rays, which form, in greatest perfection, the power of determining chemical combinations. It has been a subject of interesting research, whether the invisible, or almost invisible rays, situated beyond the extremities of the spectrum, poffefs any other properties of light. *E. gr. If the reflection of them from polished glass can give them that modification which Malus has distinguished by the name of 'polarization.' [See Light.] M. Berthollet engaged Mehrs. Malus and Berard to undertake this double object. M. Malus's death prevented his prosecution of the subject; but what he began M. Berard accomplished with the utmost possible exactness. By means of the heliotrope, which Malus caucled to be constructed for the philosophical cabinet of M. Berthollet, he obtained a ray of light, perfectly fixed, on which he could make experiments at pleasure. By decomposing this ray with a prism, he obtained an immovable coloured spectrum; and by placing very few sensible thermometers in the spaces occupied by the different colours, he was enabled to compare their calorific effects with the utmost certainty. He also ascertained their chemical properties by submitting, in place of the thermometer, chemical compounds easily altered. He first of all observed the calorific power of the different rays, which, it is known, are in this respect unequal. M. Rochon, who is said to have first observed this inequality, placed the maximum of heat in the yellow ray, where the illuminating power is the greatest. Dr. Herschel, as we have before shown, placed it out of the spectrum, and beyond the red ray. The experiments of Herschel have been confirmed by those of Berard, as far as they respect the progressive heating power of the rays from the violet to the red; but he found the greatest heating power at the extremity of the spectrum itself, and not beyond it. He fixed it at the point, where the bulb of the thermometer was still entirely covered with the red ray; and he found that the thermometer sunk progressively, in proportion as the distance of its bulb from the red ray increased. When he placed the thermometer quite beyond the visible spectrum, on the spot where Herschel fixed the maximum of heat, its elevation above that of the ambient air was only one-fifth of what it had been in the red ray itself. The absolute intensity of the heat produced was likewise less in the experiments of Berard than in those of Herschel.

M. Berard wished to know if these properties would exist in each of the pencils into which the ray divides itself, passing through a rhomboid of Iceland spar. In this case each of the two spectra exhibited the same properties. In both, the calorific power diminished from the violet to the red end; and it extended beyond the last visible red rays. In this operation the luminous molecules are polarized by the crystal. In order to determine whether the invisible rays of heat experience the same effect, M. Berard received the solar ray upon a polished and transparent glass, which polarized a portion of it by reflection. This reflected ray was then received upon a second glass, fixed in an apparatus, which permitted it to be turned round the ray under a constant incidence, and this incidence itself was determined in such a manner, that in a certain position of the glasses the reflection ceased to take place. We know, from the experiments of Malus, that a glass may be always disposed in such a manner that this condition is fulfilled. Things being thus disposed, by collecting with a mirror the calorific and luminous rays reflected from the second glass, and directing them upon a thermometer, M. Berard found, that as soon as light was reflected the thermometer was elevated, and of course the heat was reflected likewise; but when, from the position of the second glass, the light was totally transmitted, the heat was transmitted at the same time, and the thermometer was not elevated. In this experiment, then, as well as the preceding, the calorific principle, whatever it may be, never separates from the luminous molecules.

To the ray of solar light employed in this experiment, M. Berard substituted a pencil of radiant heat proceeding from a body hot, but not red, and even not luminous. The effect was the same as before. The thermometer rose when the second glass was so situated as to reflect light, and it did not rise when the second could not reflect light. Therefore the particles of invisible radiant heat are modified by reflection, precisely like light.

After having thus determined the calorific properties of the different rays of the spectrum, M. Berard examined their chemical properties. When muriate of silver, or other white salts of silver, are exposed to light, they become dark coloured very speedily. Guaiac thus exposed to light passes from yellow to green, as Dr. Wollaston observed. Gay-Lussac and Thenard discovered another action of this light still more prompt and energetic. When a mixture of oxygenated acid gas and hydrogen gas are exposed to the action of solar light, decomposition takes place, and water and muriatic acid are formed. These different phenomena enabled M. Berard to examine the chemical powers of the different rays of the spectrum. By exposing to the different coloured rays, pieces of card impregnated with muriate of silver, or small phials filled with the detoning mixture, he was enabled to judge of the energy of each by the intensity or rapidity of the chemical change which it produced. He found that the chemical intensity was greatest at the violet end of the spectrum, and that it extended, as Ritter and Wollaston had observed, a little beyond that extremity. When he left substances exposed for a certain time to the action of each ray, he observed sensible effects, though with an intensity continually decreasing in the indigo and blue rays. Hence we must consider it as extremely probable, that if he had been able to employ re-actives still more sensible, he would have observed analogous effects, but still more sensible, even in the other rays. To shew clearly the great disporportion which exists in this respect between the energies of the different rays, M. Berard concentrated, by means of a lens, all that part of the spectrum which extends from the green to the extreme violet; and he concentrated, by means of another lens, all that portion which extends from the green to the extremity of the red. This last pencil formed a white point so brilliant that the eyes were scarcely able to endure it; yet the muriate of silver remained more than two hours exposed to this brilliant light without undergoing any sensi-ble
ble alteration. On the other hand, when exposed to the other pencil, which was much less bright, and less hot, it was blackened in less than six minutes. M. Berard concluded, from this experiment, that the chemical effects produced by light are not solely owing to the heat developed in the body by its combining with the sublimate of the body; because, on such a supposition, the faculty of producing chemical combinations ought to be greater in those rays which possess the faculty of heating in the greatest perfection; but perhaps we should find less opposition between these two opinions, if we attended to the different results which may be produced by the same agent placed in different circumstances, and if we considered that agents of a nature quite dissimilar may determine the same combinations when they are employed.

Various hypotheses have been suggested in order to account for the properties above stated. If we wish to consider solar light as composed of three distinct sublimates, one of which occasions light, another heat, and the third chemical combinations; it will follow that each of these sublimates is separable by the prism into an infinity of different modifications, like light itself; since we find, by experiment, that each of the three properties, chemical, coloring, and calcining, is spread, though unequally, over a certain extent of the spectrum. Hence we must suppose, on that hypothesis, that there exist three spectrums one above another; namely, a calcining, a coloring, and a chemical spectrum. We must, likewise, admit that each of these sublimates which compose the three spectrums, and even each molecule of unequal refrangibility which constitutes these sublimates, is endowed, like the molecules of visible light, with the property of being polarized by reflection, and of escaping from reflection in the same potions as the luminous molecules, &c.

Instead of this complication of ideas, let us conceive simply, according to the phenomena, that light is composed of a collection of rays unequally refrangible, and of course unequally attracted by bodies. This supposes original differences in their size and velocity, or in their affinities. Why should those rays, which differ already in so many things, produce upon thermometers, or upon our organs, the same sensations of heat or light? Why should they have the same energy to form or separate combinations? Would it not be quite natural that vision should not operate on our eyes, except within certain limits of refrangibility; and that too little or too much refrangibility should render it equally incapable of producing that effect. Perhaps these rays may be visible to other eyes than ours, perhaps they are so to certain animals, which would account for certain actions that appear to us marvellous. In a word, we may conceive the calcining and chemical faculty to vary through the whole length of the spectrums, at the same time with the refrangibility, but according to different functions; so that the calcining faculty is at its maximum at the violet end of the spectrums, and at its minimum at the red end; while, on the other hand, the chemical faculty expressed by another function is at its minimum at the red end, and at its maximum at the violet end, or a little beyond it. This simple supposition, which is only the simple statement of the phenomena, equally agrees with all the facts hitherto observed, and accounts for those established by M. Berard, and even enables us to predict them. In fact, if all the rays, which produce these three orders of phenomena, are rays of light, they must of course be polarized in passing through Iceland crysal, or in being reflected from a polished glass with a determined incidence; and when they have received these modifications, they must be reflected by another glass, if it is properly placed, to exert its reflecting energy on the luminous molecules. On the other hand, if that force is null on the visible luminous molecules, the invisible light will not be any longer reflected: for the cause which occasions or prevents reflection appears to act equally upon all the molecules, whatever their refrangibility may be. It ought, therefore, to act upon the molecules of invisible light, the condition of visibility or invisibility relating merely to our eyes, and not to the nature of the molecules which produce these sensations in us.

This mode of viewing the facts appeared to Meffrs. Berthollet, Chaptal, and Biot, who made a report to the Institute on the Memoire of Berard, the most natural and simple; though the mode of refere of Berard restrained him from deciding in a cafe, not sufficiently examined by the test of experiment. Annal. de Chimie, vol. xxxv. p. 369. of Thomson's Annals of Philosophy, No. 9.

Ray, Common, in Optics, is sometimes used for a right line drawn from the point of concourse of the two optical axes, through the middle of the right line which pæflies through the middle of the centres of the pupils of the two eyes.

Rays, Cone of. See Cone.
Rays, Deflection of. See Deflection.
Rays, Inclination of incident. See Inclination.
Rays, Optic. See Optic.
Rays, Reflectivity of. See Reflectivity.
Rays, Principal, in Perspective, is the perpendicular distance between the eye and the vertical plane or table, as some call it. See Perspective.
Rays, Pencil of. See Pencil of Rays.
Rays, Pyramid of. See Optic Pyramid.
Ray of Curvature, in Geometry, is used to signify the demi-diameter of the circle of curvature. See Radius and Curvature.
Ray, Clavated. See Raia Clavata, and Thornback.
Ray, Eagle. See Raia Aquila.
Ray, Electric or Smooth, a species of the Raiu. See Raia, Torpedo, and Anatomy of Fish.
Ray, Fuller, Raia fullonica, a species of ray, deriving its name from the instrument which fullers use in smoothing cloth, the back being rough and spiney. See Raia Fulonica.
Ray, Oblong. See Raia and Rhinobatos.
Ray, Oceluted. See Raia and Miraletus.
Ray, Rough. See Raia Rubus. At Scarborough, where it is common, it is called the white hants or gullet.
Ray, Shagreen, called at Scarborough the French ray, is about the size of the skate, but narrower in its form than the common kinds. The upper part of the body is covered closely with small thorn-like tubercles, resembling the skin of the dog-fish; and from the nofe to the beginning of the pectoral fins is a tuberculated space. Pennant.
Ray, Sharp-nosed. See Raia Oxyspinus. This fish makes a snotting noise, and is suppos'd to be the bos of the ancients, which Oppian describes as the broadest among fishes, and fond of human flesh; adding, that the method it takes of delirying men is by overlaying and keeping them down by its vail weight till they are drowned. Pennant.
Ray, in our Old Writers, a word appropriated to cloth never coloured, or dyed, 11 Hen. IV. c. 6. Blount, Cowell.
Rays, in Botany, the spreading marginal foliis of a compound flower; see Radius. The same term is applied to the sub-divisions of an umbel, more properly denominated
Ray-Grafs, in Agriculture, an useful sort of early graves that has long been, and still is, much cultivated by the farmer in some districts. There are said to be different varieties of this geese, but that grown by Mr. Peacey, of Devonshire, has been found, on experience, much superior to the common sort. This geese has sometimes the title of ray-graves. See Loliwm Perenne.

It has been remarked by the Rev. Mr. Duncan, of Kilmarrock, in the fourth volume of Communications to the Board of Agriculture, that it has been found of late that there is an annual and perennial kind; that the latter should only be sown; but that the annual, he thinks, affords the greatest and most palatable crop of hay, and may be sown on those light soils which more readily tend to geese, at least a considerable proportion of it should be blended with the perennial geese. He adds, that the two kinds of geese are readily distinguished by a careful observer, as the perennial is smaller, and fairer in colour, than the annual, and likewise much lighter. Good annual geese weighs from 21 to 24 lbs. avoirdupois weight per bushel, but the perennial only from 16 to 18 lbs. As no distinction of these geese was formerly made by farmers, he suggests it as probable that they have come to be known and distinguished, from the circumstance of no ray-graves disappearing wholly the first year, by which fome perons have been tempted, from the high price of the geese, to allow what remained in the second year to advance to maturity, though to the great injury of the pasture. It is therefore from the seed of the second year's crop that he supposes the perennial geese has gradually originated; and its inferiority in point of substance feems, he thinks, to prove the supposition. By this means the farmer may, by allotting a small portion of good land for the purpose, supply himself with what is faid to be the perennial geese, without submitting to the imposition of an extravagant price, and may probably enjuice or improve upon the durability of it, by collecting geese from the third or fourth year's growth.

It is found to be an excellent geese for pasture as well as hay. It has an early, but not very abundant, foliage. It is highly relished by cattle and sheep. From its being apt to run up into flowering items, it should be kept well fed down. From its secreting and depositing much fecharine matter in the joints of the items, it affords a large proportion of nutritious matter for the support of animals, both in its green state and when made into hay. And it is said not to affect the wind of horsesh, which renders it particularly valuable for hunting and racing horses.

It has, however, been objected to by some, from the quantity of flower items which it yields up; but this is allayed by others to be only the cafe when it grows in dry upland situations. It is found, of course, to vary much under different circumstances and situations.

The items that are most suitable for it are those of the loamy and sandy kinds, but it is capable of being grown on those of the clayey sorts when not too stiff. On the two stiff sorts, a mixture with other geese, it frequently becomes permanent, and affords an useful spring food, especially for sheep rook.

As it is found to produce a thick well-connected sward in items of the rich fertile sorts, it has been suppos'd only suited to them, though occasionally met with in those of the poorer descriptions.

In Essex it is found very bad for the strong wet heavy lands.

But in other districts it is most sown in light clayey soils, where clover is liable to fail in coming up well. Some, however, find that a light soil is quite as suitable for it as one of a clayey nature; and that though it may be most sown in light heavy lands, it is not from the notion that lighter soils are less suited to it, but that such lands may be covered with this geese, should the clover crop not turn out well in consequence of the great richness of these clayey soils.

On the light clayey soils the proportion of feed is usually from one bushel to one bushel and a half of ray-graves, with eight or ten pounds of red clover feed, to the acre. On other soils from fix to ten gallons of ray-graves, with from five to eight pounds of red clover feed, and from two to four pounds of trefoil feed, are used to the acre; some adding to these, two, three, or more, pounds of white clover feed.

In Sussex, for a layer for one or two years, they employ of ray-graves feed three gallons, and of red clover and trefoil feed each one gallon, to the acre.

But for permanent pasture the proportion is this. Of ray-graves feed four gallons, Dutch clover and trefoil feed, of each two gallons to the acre. Other different proportions are made use of in different cases.

It has been well remarked by Dr. Campbell, in the third volume of Communications to the Board of Agriculture, that when land is in a proper state of manure, ray-graves united with white clover, will form a perfect sward the latter end of the second year after it is sown. A particular field, of about five acres, that was sown with these two geese only, was, he says, more perfectly grassed over, than others, which had the addition of trefoil and rib-graves, and which were sown at the same time. A neighbour of his, the only man in the county that had tryed ray-graves, told him it would not answe, and referred him to a particular field where some had been sown. The fact was, the doctor says, that he had cropped his field with oats until it was no longer worth ploughing, and then, with his last feed, he sowed ray-graves, which certainly did not flourish. But his argument would, he thinks, have been equally conclusive against any geese or grain whatever. The ray-graves languished, and finally died away, giving place to the vegetation suited to the state of the land. If it be expected that ray-graves, or any other good geese, should thrive and produce abundant crops on exhausted or poor land, it must not, he says, be in the soil which occurs here. And he adds the following useful remarks, on converting ray-graves into hay; it is necessary to cut it at a period previous to its being so ripe as to have perfefted its feed, and changed to a yellow colour; or in this case a great part of the juices of the plant, which constitute a principal part of the nutriment it is to afford, will be converted into a species of flaw, and its nutritive properties be proportionally diminished. When it is made into hay, perons not acquainted with its qualities are apt to object to its apparent coarfeness, which proceeds from its confilling almost entirely of flowering-items, the ray-graves having a comparatively smaller proportion of leaves than any other geese. Whether this be a defect or a merit will, he thinks, depend upon a solution of this question: Do the items and flowering parts of geese, or the leaves taken weight for weight, contain the greater proportion of nutriment? It does not appear, he says, that this has been determined by experiments instituted for the purpose; but it seems probable, from the items being so much sweeter than the leaves, (which is particularly perceptible upon chewing them when about half dry,) and from those vegetables which contain much fcharrine matter being particularly nutritious, that the greater proportionate quantity of
nutriment will be found to reside in the salks; and if so, the advantages of ray-grafs will be decisive. But, however this may be, it is certain that, supposing wet weather comes during the process of hay-making, the first part of the grafs that decays is the leaf, which soon becomes yellow, and then black, losing all pretensions to nutritive properties; in which case it is evident that almost the whole nutriment contained in the hay must reside, exclusively, in the flowering-salks. Ray-grafs then has, in unfavourable hay-salfons, an advantage, he thinks, over all others, insomuch as from having fewer leaves it is not so apt to be injured by a continuance of rain; and it is, besides, when in the soks, more acces-
sible to the air and wind from lying more open and light; and consequently not so apt to heat and mould as other grafses in similar situations and salfons. And he concludes that it certainly possesses the following valuable properties.

1. That there are few grafses so early in the spring.

2. That there are none better suited by cattle, or more nutritive.

3. That it has the power of refilling the effects of bad weather, in tickish salfons, in a greater degree than other grafses.

4. That there is a greater facility in collecting its feed than of any other grafses.

It is supposed that the prejudices against it have proceeded, 1. From its having been found in land not capable of producing a full crop of any good vegetable. 2. From allowing it to shoot up so far, as to have formed the feed in the flowering-salks, before cattle have been turned into paffure, or that it has been cut for hay. Ray-grafs appears, he thinks, to partake more of the nature of grain than any other grafs. Hence, when it has perfected its feed, it shoots out no more salks, and but few leaves that salfon, as lord Kaines has juftly observed. Hence it is neccessary to turn cattle into a field of this grafs early in the spring, and to keep it well under by a sufficiens quantity of slock; in which cafe it will continue to put out fresh flowering-salks and leaves during the whole salfon. 3. The hay, for the reafon just alined, should be cut before it becomes a mere sraw. Common hay-grafs, being composed of grafses in various fages of growth and ripeness, admits of greater latitude than a field of ray-grafs, because many of them will generally be in a proper flate for cutting, although others may have palled their prime.

He adds the following facts in support of its nutritious properties. No hay, says he, could be better refilled by my horses than this was; not a particle of it was walled by them, or left in the rack; no animals could thrive, coat, or do their work better, than they did, whilst they had this ray-
grafs hay to take to. Never was there a greater contrast than when they were put to the natural hay-grafs of the country, after they had refilled the other. They were literally starved into the eating of it; and in spite of an addi-
tional quantity of corn, they fell away (agreeable to his farming man’s mode of expreffion) a limb a-piece. This year nothing can look better than his horses do upon this hay, (with some red clover mixed,) and this, with the adfion of very little corn, and that mostly light, the tailings of oats and barley.

These facts place the utility of this grafs in a very striking point of view. And the following, given by Mr. Duncan, are of the fame tendency, as he found in a comparative ex-
periment of pieces of ground laid to paffure with it, and meadow soft-grafs alone and in mixture, that the ray-grafs portion was not only more early ready for the fcythe by nearly three weeks, but the hay of it always more greenly eaten by the horses and cattle, as well as the paffure in suc-
ceeding years, on the ray-grafs divifion, contantly eaten bare before the cattle flock would touch that of the foit grafs.

In the county of EfleEf the farmers in many places have, however, a very indifferent opinion of ray-grafs, believing it to do great injury to the land, especially when of the better kind. When fown with red clover, it does not do so well or is so good as a preparation for wheat, but it answers well for peafe. In trying it mixed and unmixed with clover, fome have found that when without it, it is all the better for the wheat; and that the wire-worm after ray is sure to destroy the wheat.

In weaning calves it is found extremely useful and ad-

tractive, as it agrees very well with them, far better than tares, which are liable to run through them, or foour.

In EfleEF this grafs is employed in mixture with others, as a fheep-feed, with great benefit and fecceeds.

The farmers in the tillage parts of Oxfordshire also con-

ider ray-grafs as preparing badly for wheat; they conceive that the wheat which follows will never be found so good where it is fown as where there is none. It is thought far from having any ameliorating effects on the land, as it draws too much. It is never fown alone by fome. It makes the very worth hay, unlefs cut at an early period, or very young, in the opinion of many.

In Berkshire this grafs is fown in the chalk district, and found to a certainty less nutritious than many other forts, as well as more exhaufing in its nature. When intended for permanent paffure, it is found, in general, to fail in a very few years; and, unlefs the feed is changed, it will degenerate under any mode of management. It, however, pos-
fefes the advantage of being cheap, and of producing early feed, which are objects of no inconfiderable importance on a farm. Some find that the Peacey variety furnifhes feed a fortnight or three weeks fooner than the common fort. It is seldom fown finely, but in mixture with many other artifi-
cial grafses, in proportions to fuit the difference of foil. In fome places it is fown with different other artificial grafses in variety, every four years, on different parts of the land, as to prevent it getting fick of the fame kind of feeds.

In the intention of hay, it should be cut early, or its juices will be much exhausted. Horses fed on this fort of hay are found to preferve their wind better than on hay of other grafses.

In Cheshire the dairy farmers do not consider it a good grafs for producing milk, on which account it is not so much cultivated; its earlines, however, has made it esteemed by many; as on almoft any foil, fome suppofe it will be a paffure a week or ten days sooner than any other kind. And its having the property of correcting the tendency of clover to produce flatulence, renders it also highly worthy of the farmer’s attention.

When for hay, if not cut early, the produce is scarcely so nutritious as sraw.

This grafs-feed is sometimes fown alone, and the quantity of feeds which the plants afford, and the facility of collecting it, are probably the reafons of its being very common; while the advantages of its earlines have led to its more frequent cultivation. It is fuggfed, however, that several grafses, as the vernal, the foz-tail, the meadow poa, and fome others, are equally as early as this grafs, and that the meadow fescue, the oat-grafs, and fome others, feem to be as well deferving of the attention of the farmer.

According to the ingenious experiments on this grafs, made under the direction of the duke of Bedford, as flated in the appendix to Sir Humphry Davy’s Agricultural Chemicly, the refults were as follow.
The quantity of produce from a rich brown loam, taken at the time of the plant's flowering, was

\[
\begin{align*}
\text{Weight when dry} & = 7827 \text{ lbs.} \\
\text{Weight of produce lost by drying} & = 3322 \text{ lbs.} \\
\text{Quantity of nutritive matter} & = 4494 \text{ lbs.} \\
\text{The quantity of produce taken at the time the feed was ripe} & = 395 \text{ lbs.} \\
\text{Weight when dry} & = 4402 \text{ lbs.} \\
\text{Weight of produce lost in drying} & = 10451 \text{ lbs.} \\
\text{Quantity of nutritive matter} & = 643 \text{ lbs.} \\
\text{Loss of weight in nutritive matter by taking the crop at the time of flowering, nearly half its value} & = 337 \text{ lbs.} \\
\text{Proportional value of the flowering graps that were taken at the time the feed is ripe, as } 10 \text{ to } 11. \\
\text{The quantity of latter mat produce} & = 3403 \text{ lbs.} \\
\text{Quantity of nutritious matter} & = 53 \text{ lbs.} \\
\text{Proportional value of the latter math graps to that of the time of flowering, as } 4 \text{ to } 10, \\
\text{and to that of the time the feed is ripe, as } 4 \text{ to } 11. \\
\text{Rayna, in Geography, a river on the W. coast of Java, which runs into the sea, S. lat. } 7^\circ 27' \text{. E. long. } 107^\circ 30'. \\
\text{Rayen, a town of the Rhine palatinate; 11 miles N.W. of Heilbron.} \\
\text{Raygen, or Rayred, a town of Moravia, in the circle of Brunn; 8 miles S. of Brunn.} \\
\text{Rayleigh. See Raleigh.} \\
\text{Raymangur, a fort of Hindostan, in Myfor, taken in 1791 by the British troops; 15 miles E. of Nundydroog.} \\
\text{Raymatla, a river of Bengal, which runs into the bay of Bengal, N. lat. } 21^\circ 35'. E. long. 88^\circ 49'. \\
\text{Raymon, a town of France, in the department of the Cher; 14 miles S.E. of Bourges.} \\
\text{Raymond de Pegafour, in Biography, a faint in the Roman calendar, was a Spaniard by nation, and born at the castle of Pegafour, in Catalonia, in the year 1175. He received the early part of his education at Barcelona, from whence he removed to the university of Bologna, where he studied the law, took his degrees, and afterwards taught the canon law for some time with great reputation. He was afterwards called to Barcelona, by Berenger, bishop of that city, who made him his canon, and provost of his cathedral church. He held these polls in the year 1218, when he established an institution which led the way to the foundation of the Order of Mercy, (see that article.) In 1222 he resigned his dignities, and became a member of the Dominican order of preaching friars at Barcelona. In 1230, pope Gregory IX. sent for him to Rome, appointed him his chaplain and confessor, and devoted on him the care of carrying on the compilation of the "Decretals." The pontiff would willingly have recommissioned him for his labours by presenting him with very considerable church preferment, but he chose rather the quiet of a monastery to the honours and emoluments of the richest fees in Spain and Portugal, which were offered to him. In 1235 he was called to assume the pontiff of general of his order; but upon the plea of his infirmities, he was sufferered, in about two years, to return to his monastery, where he spent the remainder of his long life. He died in 1275, having entered on the 100th year of his age. To his everlasting disgrace, he is said to have been principally instrumental in introducing the Inquisition in the kingdom of Arragon, and into Languedoe, a circumstance which probably was the means of his canonization in the year 1601. He was author of "Summa de Caflibus potentiulis, seu de Peuententia et Matrimonio," which was long popular in the Catholic world, and went through numerous impressions. The best edition of it is that published by father Laget, at Lyons, in 1708. Raymond's chief work is "Lib. V. Decretalium," commencing with the papacy of Alexander III., where the decrees of Gratian terminate, which was approved by pope Gregory IX., and constitutes the second volume of the papal canon law. Moreri. Raymond Lully, a philospher of much celebrity in the dark ages, was born at Majorca in 1234. He was brought up a sinner, and led the life of a man of pleasure. Falling in love with a young woman, who was deaf to his addresses, on account of a cancer with which she was afflicted, and which the exhibited to his view, in order to make him deaf from his importunities, he was so much afflicted with the light, that he retired from the world, devoting himself to pious pursuits, and in the search of a remedy for the dis ease with which the object of his affection was afflicted; this was the chief motive for the chemical labours for which he became so famous. He undertook a course of travels into the East, for the purpose of converting the Mahometans to the Christian faith, and incurred very great hardships, and the most serious dangers. So great was his zeal for this object, that being unable to persuade certain Christian princes to engage in it, he entered into the Franciscan order, and returned to Africa, with the hope of obtaining the honour of dying a martyr. He was accordingly thrown into prison, and after suffering much torture, and long imprisonment, he was freed through the interest of some Genoese traders, who took him on board their ship to convey him home. He died just when he had arrived within sight of his native land, in the year 1315. As a chemist, his chief object was the pursuit of the philosopher's stone, and the universal remedy for all disorders. Boerhaave, who had perused the works of Lully, speaks highly of their merit; he finds them, he says, "beyond all expectation, excellent, so that he doubted whether they could be the work of that age. So full are they of the experiments and observations which occur in later writers, that either they must be suppos itious, or the ancient chemists must have been acquainted with many things which pass for modern discoveries." Lully is supposed to have derived his chemical knowledge from his travels in the East, particularly from the writings of Geber. A complete edition of all the writings attributed to him, was printed at Mentz. Raymond Lully is chiefly celebrated for an invention by which he pretended to enable anyone, mechanically, to invent arguments and illustrations upon any subject, and thus to reach the summit of science at a small expense of time and labour. This "Great Art" professes to furnish a general instrument for affording invention in the study of every kind of science. For this purpose, certain general terms, which are common to all sciences, are collected and arranged, not according to any natural division, but merely according to the caprice of the inventor. An alphabetical table of such terms was provided, and subjects and predicates taken from these were inscribed in angular spaces, upon circular papers. The sciences, qualities, affections, and relations of things, being thus mechanically brought together, the circular papers of subjects were fixed in a frame, and those of predicates were so placed upon them as to move freely, and in their revolutions to produce various combinations of subjects and predicates; whence would arise definitions, axioms, propositions, varying infinit ely, according to the different application of general terms to particular subjects. Such is the general idea of the Lullian art, which, however applauded by certain writers of
that period, may be pronounced as unworthy of notice, except as a specimen of the artifice with which men frequently impose upon vulgar credulity. Enfield's History of Philosophy.

Raymond, in Geography, a township of America, in Rockingham county, New Hampshire, incorporated in 1764, containing 898 inhabitants; 12 or 14 miles W. of Exeter.

Raymond, or Raymam-town, a post-town in Cumberland county, and district of Maine, containing 825 inhabitants; 142 miles N.N.E. of Boston. The land is generally level, excepting one large hill, called Rattlekake-hill, from its abounding with those reptiles. The greater part of the growth is pine and white oak, and the soil is difficult of culture.

Raynal, William-Francis, in Biography, a French writer of celebrity, was born at St. Genes, in the Bourbon, in 1713. He entered at a very early age among the Jesuits, and by his abilities excited high expectations of his future celebrity. His dislike of restraint induced him to quit the society in the year 1748, although he had made his profession, and had been ordained priest. He now entered his career of authorship, and distinguished himself as a political, historical, and miscellaneous writer. His first piece, published the same year in which he quitted the society, was entitled "Histoire du Stad Thonderat"; he next published "Histoire du Parlement d'Angleterre," which gained him much reputation, though it had little claim to the dignified title of history, and was, moreover, tinged with many prejudices, religious and political. He also compiled "Anecdotes Literaires," in three vols. 12mo.; and "Memoires de Ninon de l'Enclos," and was much employed in the "Mercure de France." The great work of the abbe Raynal was entitled "Histoire Philopolique et Politique des Etablisemens et du Commerce des Europeens dans les deux Indes," to the composition of which he was led by his engaging in some commercial speculations, thinking them likely to turn more profitably than literary pursuits.

His history was published in 1770, and as it contained history, description, and calculation, intermixed with political and philosophical reflections, and was, through the whole, animated by an ardent spirit of philanthropy, and hatred of tyranny, civil and religious, it became popular, and the author was looked up to as one of the reformers of the age. Critics, however, soon found that, as a literary and philosophical work, it would not bear the test of examination. The fyle, though rich, was exceedingly declamatory; the images were frequently inalining; and his principles vitiated by the licentiousness of his country; and the facts upon which the whole was founded were derived from incorrect or dubious documents. The author, it should seem, was soon made sensible of the imperfections of his work, and determined to improve it by travel; with this view he visited the principal commercial towns in France, and passed into England and Holland, at every place making inquiries among travellers and merchants with the most unremitting industry. On his return, he published at Geneva an improved edition of his work, in 10 vols. 8vo., containing many additions and corrections. Its tone was unaltered, and its attacks upon existing authorities were fo bold, that the parliament of Paris ordered it to be burnt, and issued a decree for apprehending the author. He retired to Spa, whence he travelled through Germany, and after having visited all the principal places, he returned to France, and lived some time quietly in the southern provinces. At the academies of Marfelles and Lyons he founded several prizes for essays upon given subjects, of which the most remarkable was whether the discovery of America had been more useful or prejudicial to Europe.

America has now, owing to the quarrel and war subsisting between Great Britain and its colonies, become an object of peculiar interest; and the abbe Raynal, in 1781, published "Tableau et Revolutions des Colonies Angloise dans l'Amerique Septentrionale," which was commented upon and exposed by Thomas Paine, who was a zealous and able defender of the American cause, against the mother country.

The abbe came to Paris in the important year 1788, when the revolution was just ready to burst forth. He had not been long in the city, before the National Assembly was convoked, and one of its early acts annulled the decree passed against him; for this favour, he addressed a letter of thanks to the president, containing a retraction of certain principles contained in his work. Observing, afterwards, that the constituent assembly were occupied in decrees which he thought were violent infringements on the rights of property, and in others calculated to augment the popular effervescence, he wrote, in May 1791, a long letter of advice and remonstrance. It was soon seen that the sentiments in this letter were very different from those which were generally expected from the author of the "Histoire Philopolique," their tendency being to reprefs popular licence, and to strengthen the hands of civil authority. Raynal, like many other philosophers of that day, had aid in his power to produce the change, at which, when put into practice, he and they were greatly alarmed. But it was now too late to return: they had flown the people their power, had taught them their rights, which it was in vain to expect they would be induced to abandon for any arguments he could produce. In the letter referred to, he says, "I have long dared to speak to kings of their duty, suffer me now to speak to the people of their errors, and to their representatives of the dangers which threaten us. I am, I own to you, deeply afflicted at the crimes which plunge this empire into mourning. It is true that I am to look back with horror at myself for being one of those who, by feeling a noble indignation against arbitrary power, may perhaps have furnished arms to licentiousness. Do, then, religion, the laws, the royal authority, and public order, demand back from philosophy and reason the ties which united them to the grand society of the French nation, as if, by exposing abuses, and teaching the rights of the people and the duties of princes, our criminal efforts had broken these ties? But no! — never have the bold conceptions of philosophy been represented by us as the strict rule for acts of legislation." He next proves, that it was not the business of the assembly to abolish every ancient institution; that the genius of the French people is such, that they can never be happy or prosperous but under a well regulated monarchical government; and that if they wished not the nation to fall under the worst kind of despotism, they must increase the power of the king. Raynal was considered to be in his dotage, and himself and his writings were now disregarded. He retired in the midst of florms to Passy, where, being reduced to a state of indigence, he died in March 1794, at the age of 85. Besides the works already mentioned, the abbe Raynal published "The History of the Divorce of Catharine of Arragon, by Henry VIII.;" and "A History of the Revolution of the Edict of Nantes," in four volumes; but he committed many of his papers to the flames during the bloody reign of the monster Robespierre.

Raynerius, a learned Italian monk, who flourished most probably in the 13th century, was a native of Pisa. He
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He acquired the character of a consummate divine and civilian, and was appointed professor of divinity, as well as raised to the most considerable offices of trust and honour belonging to his order. It is uncertain at what period he died. He left behind him many works, of which the chief is entitled "Pantheologia, seu, Summa universæ Theologiae." This is a dictionary of theology, with the subjects disposed of in alphabetical order; it has been held in high estimation among the members of the Catholic communion. It has gone through several editions in folio and quarto. The last edition was printed at Paris in 1655, in 3 vols. folio, with additions of father Nicolai.

RAYNHAM, in Geography, a township of Massachusetts, in Bristol county, taken from Taunton, and incorporated in 1731. It contains 1154 inhabitants. Besides the great river Taunton, this township is watered by several streams, upon which are six saw-mills, three grist-mills, a furnace, a forge, and fulling-mill. Here are also numerous ponds, of which Nippanniquit, or Nippahoniit, is two miles long and one broad. In this pond millions of alewives annually resort and leave their spawn in it. An excellent kind of oar, and various kinds of fish, are found in this township. Besides the usual occupations of husbandry and mechanics, many of the inhabitants are employed in the manufactories of bar-iron, hollow ware, nails, iron for vesseis, iron-hovels, pottash, thingles, &c. The first forge set up in America was introduced into this town by James and Henry Leonard, natives of England, in 1652. The family, in the 6th generation, now ploughs it. King Philip's hunting hounds flushed on the northern side of Fulling pond, about one mile and a quarter from the pond. When the war broke out in 1675, which terminated in the death of the king and the ruin of his tribe, he left strict orders to all his Indians not to hurt the Leonards. Before Philip's time, Fulling pond was two miles long, and three miles and a quarter wide. But the water is now almost gone, and the large tract it once covered is grown up to a thick-fet swamp of cedar and pine. The vicinity has abounded with excellent oar, which has supplied the forge for 80 years; it is, however, incapable of being wrought into iron of the best quality.

RAYNOLES, or RAYNOLDS, John, in Biography, a learned English divine, was born at Pinhoe, near Exeter, in the year 1549. In 1562 he was admitted a student at Merton college, Oxford, whence he was removed, in 1563, to a fellowship of Corpus Christi college. In 1572, having taken his degrees in the arts, he was appointed Greek lecturer in his college, in which department he acquitted himself with great applause. Fuller speaks of him in the highest terms as a commentator of Aristotle's Rhetoric. He had hitherto been zealously attached to the Popish religion, while his brother William was equally zealous for the Reformation. The difference in their sentiments leading them to frequent conferences and disputations, they made converts of each other, William becoming a determined Papist, and John a steady Protestant. He frequently appeared in the pulpit, and was greatly admired as a preacher. In the year 1588 he was admitted to the degree of doctor of divinity, and soon afterwards the fame of his great learning induced queen Elizabeth to appoint him professor extraordinary in that faculty at Oxford; after which she gave him the deanery of Lincoln, which he held only a short time, when he exchanged it for the presidency of Corpus Christi college, of which he was a fellow. He made this exchange from his attachment to an academical life, and his love of retirement and study. Similar motives led him afterwards to refuse a bishopric which queen Elizabeth offered him. He retrieved the finances of his colleges, which had been suffered to fall into dilapidation, and he reformed his decayed discipline, strictly obeying the statutes himself, and compelling all the other members to observe them. After the accession of James, he was appointed, with Dr. Sparks, Mr. Chaderton, and Mr. Knewthubs, to appear on behalf of the Puritans in the pretended conferences at Hampton Court; of which we have a full account in the second volume of Neal's "History of the Puritans," by Dr. Toulmin, p. 10–20. Dr. Raynolds did not on this occasion act according to his usual spirit, and, suffering himself to be browbeaten by the royal tyrant, lost much of the respect which his character usually laid claim to. It was at the conclusion of this conference, that the king said to Dr. Raynolds and his friends, in answer to their arguments; "If this be all your party hath to say, I will make them conform themselves, or else I will harry them out of the land, or else do worse, only hang them, that's all." When James gave directions for undertaking a new and more correct translation of the bible, Dr. Raynolds was one of the Oxford divines who were commissioned to give a new version of the four greater prophets, the book of Lamentations, and the twelve minor prophets. While employed in this great work he was feized with the gout, under which he had been a sufferer many years, and which at length proved fatal to him. In the midst of the severest pains, he persevered in the task assigned to him, and once a-week his fellow-labourers at Oxford regularly assembled in his apartments, where they compared the fruits of their respective studies, determining what appeared to them to be the most faithful translation, till they had accomplished their task. Dr. Raynolds died in the year 1677, highly respected for his erudition, his piety, his modesty, and humility. Several of his biographers speak of him in the highest terms. Wood says he was a prodigiously seen in all kind of learning, and had turned over all writers, profane, ecclesiastical, and divine, all the councils, fathers, and histories of the church. He was author of many theological works, of which we may mention "De Romanæ Ecclesiæ Idolatria, in Cultu Sanctorum, Reliquiarum, Imaginum," &c. 1596; and "Centuria Librorum Apocryphorum Veteris Testamenti, adversus Pontificios," which was a polemical work, and printed at Oppenheim, in Germany, 1611, in 2 vols. 4to.

RAYPOUR, in Geography, a town of Hindooftan, in Bahar; 40 miles N.W. of Chuprah.

RAYPOUR, a town of Hindooftan, in Bahar; 32 miles E. of Bahar.

RAYPOUR, a town of Bengal; 55 miles W.S.W. of Burdwan. N. lat. 22° 48'. E. long. 87° 5'.—Also, a large and commercial town of Hindooftan, in the country of Ruttunpour; 55 miles S. of Ruttunpour. N. lat. 21° 24'. E. long. 82° 28'.

RAYPOUR, or Ray-Gaut, a remarkable pass on the Beyah river, about 17 or 18 miles from Noorpour; situated a considerable way within the level country of the Panjab.

RAYTE, or Ryche, in Ichthyology, a name given by Joannes Cuba, Albertus, and others, to the common skate, or flaire. See Rayta Bait.

RAZANT. See Razant.

RAZANT Flank. See Flank.

RAZANT Line of Defence. See Defence.

RAZBOINIKOVA, in Geography, a town of Russia, in the government of Irkutsk, on the Angara; 56 miles N.W. of Balaganusk.

RAZBOINOK, a fort of Russia, on the Ural; 92 miles E. of Orenburg.

RAZE,
RAZE. See Tomb.
Raze, in the Manuge. A horse is said to have razed, whose corner teeth cease to be hollow; so that the cavity, where the black mark was, is filled up; that is, wholly disappears, and the age of the animal cannot be known with any degree of certainty. See Mark.

RAZI, in Biography, one of the surnames of the famous Mul Unified the famous

Muhammad and Ben Omar Ben Khatid Riz, Al Tom in Al-Biruni, a native of the city of Rez, in the Persian Iran, of which the word Razi is the appellative. He was born in the year of the Hegira 543, corresponding with 1148 of the Christian era, and became one of the most celebrated doctors. His knowledge was not confined to the learning usually taught in the Mohammedan schools, but it comprehended likewise the sciences imported into the East with the writings of the Grecian fages. He was, moreover, a very eloquent preacher both in the Arabic and Persian languages. By these qualifications he acquired the favour of several princes, particularly of a sultan of the Gaurid dynasty, who erected a college for him in the city of Herat in Chorasan. He was driven from this situation by the intrigues of Cadi Abdalmegid, of the sect of Karamians, who contended that the deity was corporeal, and of human shape. Having challenged Razi one day to a public disputation on the attributes of God, he was so confounded by the superior reasoning of the latter in defence of the divine spirituality, that he became his bitter enemy, and feigned every opportunity of calumniating him to the sultan, as a man who, under the cloak of philosophy, concealed irreligious and impious notions. By his perjuries, the prince banished Razi from the city, but he soon repented of his rash decree, and recalled him. This happened in the year 606 of the Hegira. He was author of an "Introduction to the most subtle Mysteries for the Use of Men of Genius," in which he expresses the principles of the Mohammedan philosophy; and several other pieces. "Select Astronomical Researches" have been attributed to him, but perhaps on insufficient authority.

Razi is also the surname of a celebrated philosopher, chemist, and astronomer, called Mohamed Ben Zakaria, a native of the same city of the preceding, who flourished under the caliphate of Mothader of the dynasty of the Abbasides. He died about the year 922 of the Christian era.

RAZIMIERZ, in Geography, a town of the duchy of Warsaw, situated between Sieprzka and Poben, where the unfortunate count Parkul was broken alive on the wheel, and impaled by order of Charles XII. of Sweden in 1708.

RAZINPAINIA, a fort of Ufalla, in the government of Upaha, on the Ural; 56 miles S.W. of Orenburg.

RAZIOIS, Port, a port at the S.W. extremity of the coast of Nova Scotia, and N.E. of cape Negro.

RAZOR, a well-known edged instrument used in shaving. Heat appears to give a partial increase of tenacity to a razor's edge, probably because the edge cools faster, contracts, and is stretched.

RAZOR-BILL, in Ornithology, the common English name of the alca, a web-footed bird with no hinder toes, common on our sea-shores. See Alca Torda.

RAZOR-FISH, in Ichthyology, the Coryphaena novaculorum of Linnaeus, having the head and fins barred with bluish lines. See Novacula.

RAZOR-ILAND, in Geography, a small island on the coast of Brazil; 12 miles S. of Rio Janeiro.

RAZUDA, a town of Hindooostan, in Guzerat; 40 miles E.S.E. of Chip Burr.

RE, an island in the Atlantic, near the west coast of France, about 16 miles long, and 3 broad; separated from the coast of Vendee by the islands of Breton, which are about 7 miles wide. The principal town is St. Martin de R. N. lat. 46° 13'. W. long. 1° 20'.

RE, in Commerce. See Ree.

Re, in Grammar, &c. an invariable particle, or preposition, prefixed to the beginning of words, to vary, double, or otherwise modify their meaning.

The Peripatetics define re-action to be that which a passive body returns upon the agent, by means of some quality contrary to that received from it, in the same part with which the agent acted, and at the same time; as if water, while it is heated by the fire, does at the same time cool the fire.

It was known, even in the schools, that there is no action in nature without re-action; and it was a maxim among them, ommis agent, agens repatis.

But the equality of the actions was not known. Sir Isaac Newton established it as one of the laws of nature, that

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action and re-action are equal and contrary; or that the mutual actions of two bodies, striking one against another, are exactly equal, but in contrary directions; or, in other words, that by the action and re-action of bodies one on another, there are produced equal changes in each: and those changes are impervious towards directly contrary parts or ways of NATURE.

Some of the school-philosophers deny any such thing as re-action, properly so called, at all; urging, that action arises only from the ratio of the greater inequality; that is, we are only to account for action the excess of action, or what the agent does more than is returned by the patient. But the equality between action and re-action sets aside this exception.

READ, in Geography, a river of England, in the county of Northumberland, which runs into the Tyne, 10 miles N. of Hexham.

Read Head, a cape on the E. coast of Scotland. N. lat. 56° 35'. W. long. 2° 28'.

READFIELD, a post-town of America, in Kennebec county, and district of Maine, bounded on the E. by Hallowell, and separated from Sterling on the W. by the eastern branch of the Androscoggin river; 8 miles W. of Hallowell, and 190 N.E. of Boston. It contains 1396 inhabitants.

READING, John, in Biography, organist, first at Lincoln, then at Hackney, and finally at St. Dunstan's church in Fleet-street, London. He was a scholar of Dr. Blow, and Stanley's first maker. He published Hymns early in life, for psalmists in parochial congregations; and, lastly, a work engraved on copper, which he called "A Book of my Anthems, with a Thorough-bafe, for the Organ or Harpsichord." He died in 1766, far advanced in years.

Reading, in Geography, a borough and market-town in the hundred of Reading, and county of Berks, England, is 38 miles W. by S. from the metropolis. It is a town of considerable extent and importance, and contains, according to the parliamentary returns of 1811, 2032 houses, and 10,788 inhabitants.

Historical Events.—Reading is unquestionably of very great antiquity; but whether it is indebted for its origin to the Britons, the Romans, or the Saxons, is unknown. Conjectures, however, have been hazarded on the subject by various writers. Camden thinks its foundation ought to be referred to the Britons; Leland calls it the Pontes Antoninius; and Dr. Beeke, the learned professor of modern history at Oxford, considers it the Calleva of Richard of Cirencester. But the circumstances which are alleged in favour of these opinions, by their respective authors, are far from being satisfactory. This place is first mentioned in history, under its present appellation, in the year 871; at which time it is described by Asser as being a fortified town, belonging to the Saxon kings, but then occupied by the Danes invaders, who had retrenched likewise after their defeat at Englefield. The victorious Saxons immediately invaded the town; but their enemies, having received reinforcements, attacked the besiegers with much impetuosity; that, after an obstinate contest, they deemed it prudent to retire to Ald. Hither they were followed by the Danish forces, which were again overthrown, and driven back to Reading. Here the latter remained unmolested till the following year, when they marched to London. In the reign of Alfred, who crowned the throne of Wessex soon after this event, the Danes once more feizcd upon Reading, and they doubtless poifoned it occasionally during their incursions in the tenth century. Throughout that long period of incessant hostility and depredation, however, this town seems to have escaped any very serious disaster; but in 1006 it was reduced to ashes by Sweyn, king of Denmark, along with its famous nunnery, said to have been founded by Elfride, widow of king Edgar, as an atonement for the murder of Edward the Martyr. Reading soon recovered from this disaster, and in the course of a century afterwards became a place of considerable importance. In 1121 king Henry I. laid the foundation of its magnificent abbey, in which his remains were subsequtently interred, according to his own desire. Stephen, who usurped the throne after Henry's death, built a castle here, which was further adorned by his antagonist Henry Fitz-Empress, who no sooner obtained the crown, than he ordered it to be demolished; so that even the site of it is now uncertain. That monarch, however, otherwise evinced much partiality for Reading. Here he passed much of his time, and convened a parliament, as also an ecclesiastical convocation, in which Baldwin was elected archbishop of Canterbury. The abbey church was finished in this reign, and dedicated in presence of the king. In 1185 he came hither from London, to receive Heraclius, patriarch of Jerusalem, who presented him with the keys of the holy sepulchre, and the royal banners of Jerusalem, which Henry returned. In the reign of his successor, Richard I., a convention for the trial of Longchamp, chancellor and bishop of Ely, who had been appointed regent of the kingdom during the king's absence, was held here. King John also held a convention in this town, in 1206; and in 1212 a council was convened here by the pope'slegate, for the purpose of effecting a reconciliation between that infatuated prince and the exiled bishops. In 1213 the king met the legate and barons at the abbey, and held a parliament. King Henry III. spent his Christmas at Reading in 1226; and twice during his reign summoned the estates of the realm hither, for the transactio of national business. He was the first monarch who granted a charter of incorporation to the town. In 1346, Edward III. held a great tournament here; and in 1359, the marriage of his son, John of Gaunt, with Blanche, daughter of Henry, duke of Lancaster, was solemnized in the abbey church. In 1384, Richard II. and his court, together with the mayor and aldermen of London, being assembled at Reading, John Northampton, the preceding mayor of that city, was convicted before them of fœtidus practices, and sentenced to perpetual imprisonment. In 1389 a great council was held at Reading, at which the king and his barons were reconciled by John of Gaunt. Parliaments were held here also in 1440 and 1451; in the former of which the order of nobles called vilcounts was first established; and in the year following, the parliament adjourned hither from Westminster, on account of the plague. King Edward IV.'s marriage with Elizabeth, lady Grey, was first acknowledged at Reading, in 1464; on which occasion she made her public appearance at the abbey, conducted by the duke of Gloucester and the earl of Warwick. In 1466 parliament was a second time adjourned to Reading, to avoid the plague. King Henry VIII. frequently resided here, having converted the dilapidated abbey into a palace. His son, king Edward VI., visited this town in 1552, when he was met by the mayor and aldermen at Coley-Crofts, and presented with two yokes of oxen; the mayor riding before him, uncovered, to the palace. The same ceremony was repeated, when Reading was visited by the bigotted Mary, and her husband, king Philip of Spain. Queen Elizabeth was a frequent visitant here, and had a seat in the church of St. Lawrence.

Early in the reign of Charles I., when the plague raged with
with great violence at London, the courts of chancery, king's bench, and common pleas, were held here, as were likewise the court of exchequer, the court of wards and liversies, and the court of requelts. In 1642, Reading was a parliamentary poll, but the garrison, being defective as to ordnance and ammunition, quitted the town, without refilience, on the approach of a party of the king's horse. In consequence of this event it became a royal garrison, and continued to be so till taken by the earl of Essex in April 1645, after a siege of eight days. The king, however, again recovered it in September the same year, and held it till May following, when he ordered the works to be demolished, and evacuated the town. After this event Reading was frequently occupied as the head-quarters of the parliamentary army, and was consequently much impoverished by the contributions levied upon its inhabitants for the support of the military. In 1688 the army of king James II. was quartered in this town, but quitted it on the approach of the prince of Orange. On this occasion a skirmish took place in the market-place between two detachments of horse, which terminated in favour of the Protestant interest, and is still commemorated, by bell-ringing, on the anniversary of its occurrence. Queen Anne visited Reading in 1700, when she was received by the corporation in state, and presented with forty broad pieces of gold in an elegant purse made for the occasion.

Municipal Government.—Reading claims the honour of having been originally constituted a guild, by charter from Edward the Confessor. This claim, however, is extremely questionable; and at all events we feel convinced that the ancient guild was nothing more than an association of mechanics and tradesmen for their individual benefit. The first monarch who conferred upon Reading the privilege of separate jurisdiction was Henry III., in the 37th year of his reign. His charter was subsequently confirmed by all his successors, but without any material alterations, till the reign of Henry VI., when the corporation is first mentioned by the title of the mayor and burgesses. Thus it continued to be designated till queen Elizabeth divided the burgesses into capital and secondey, and declared the mayor and them to be a common council for the borough. That prince further conferred upon the corporation considerable effates. Charles I. authorized aldermen to be elected, and invested the mayor and them with ample powers for the government of the town. This charter was confirmed, after the restoration, by his son Charles II., and is the one under which the corporation now acts. By it the officers are declared to be a mayor, twelve aldermen, and the same number of capital burgesses; the mayor, and his deputy, (the preceding mayor,) the senor alderman, the bishop of Salisbury, and his chancellor, being justices of the peace for the borough, and empowered to hold feessions, and a court of record. The recorder is an officer added by Charles II., who likewise first acknowledged the town clerk. Reading sent members to parliament from the time of the earliest records. Before 1716 the right of election was vested in the freemen not receiving alms, and in the inhabitants paying poor and lot; but in that year it was limited, by a decision of the house of commons, to the inhabitants paying poor and lot only. The number of voters is estimated at 560, and the mayor is the returning officer. The spring afizes for the county are held at this town, as are likewise the Epiphany feessions, but the summer afizes are held at Abingdon, and the Michaelmas, either there or at Reading, as the magistrates may judge most convenient.

Reading is a town of considerable extent, situated on both banks of the river Kennet, which separates itself into several branches in passing through the town. It contains three parishes, St. Giles, St. Mary, and St. Lawrence, and is divided into five wards, called the High-ward, New-ward, Minster-ward, Old-ward, and London-ward, for each of which a constable is appointed. Formerly it was a place of great trade in woollens, but that manufacture fell to decay during the seventeenth century, and has never since revived. At present the chief manufactured products are, coarse linens, (such as sheeting, fail-cloth, floor-cloth, and facking goods,) gautes, crapes, muffates, ribbons, hat-bands, shoe-liner, and other similar articles. These afford employment to a great portion of the inhabitants among the lower orders; but the principal support of the town arises from its water communications with London, Bath, and Bristol. The articles exported are, flour, of which 20,000 facks are sent annually to the metropolis, timber, bark, straight hoops, linen, wool, cheeff, beer, and a variety of minor articles; in exchange are received groceries of every kind, iron, spirits, fir timber, deals, flaves, Portland stone, bricks, hemp, flax, hides, leather, coals, Bath free-flone, Birmingham goods, &c. For the convenience of trade, several wharfs are formed at Reading, and many improvements have been lately made in the internal navigation of the districts at large.

This town, from time immemorial, has been noted for its markets, which are held weekly, on Wednesday and Saturday. The Wednesday's market is chiefly for fruit; but that of Saturday embraces corn and every article of provision. The spot on which the corn market is held, is a spacious piece of ground, of a triangular form, environed by commodious shops for the accommodation of people attending the market, who may be supplied here with colonial or manufactured goods cheaper than in any other town in the county. This market-place is kept in repair by the corporation, for which they are entitled to take one pint out of each fack of corn sold in the market, amounting to about 54,000 quarters annually. The provision market buildings adjoin to the corn market-place, and form a large square, containing, one-half of two ranges of butcher's shops, and the other half of apartments for the market-women, who bring butter, eggs, poultry, &c. for sale. At the southern end of this building is a square open area for fishmongers' and hawkers' stalls, and next to this, and fronting a street called Fish-street, is a large square gate-way, over which is the house occupied by the clerk of the market. Besides these market-places, there is another for the sale ofscore pigs, conveniently situated between Friar-street and Broad-street. This is private property, but the corporation receive the toll. At Reading are four annual fairs, one on the 2d of February, another on the 1st of May, a third on the 25th of July, and a fourth on the 21st of September. The three frst are chiefly for the sale of horses and cows; but the last is also a fair for the hiring of servants, and is further remarkable for the quantity of cheese brought hither from the counties of Gloucester and Wilts. Hops are also plentiful at this fair.

The houes of Reading are mostly confructed of brick, and are generally disposed in regular streets, some of them very narrow, which have been paved under the authority of an act of parliament, passed in the year 1785.

The principal public buildings and institutions in the town are the three churches of St. Lawrence, St. Mary, and St. Giles, and several dissenting meeting-houses, the town-hall and free-school, the blue-coat school, the grammar school, the foundation school, the school of induftry, the Lanealterian school, the school for national education, the theatre, and the county gaol.
The church of St. Lawrence was chiefly erected towards the close of the 16th century, and is partly constructed of materials taken from the buildings of the abbey. Among the parts of it, so pillared from the monastery, is a large doorway, which is composed of a circular arch, ornamented with rich mouldings, from which were fupplied on each side the arms of the abbey; but these are now nearly obliterated. This doorway is likewise ornamented with niches, in which statues formerly stood. The advowson of the church belongs to St. John's college, Oxford. St. Mary's church is somewhat more ancient than that of St. Lawrence, having been constructed about the year 1547, in the stead of a previous one, which had gone to decay. Some portions of this building have evidently belonged to an older edifice, particularly a window over the west door, which is in the early pointed style of architecture. St. Giles's church was probably constructed at the commencement of the 12th century. The tower only is modern, the ancient one having been demolished during the civil war. The livings of both the churches last mentioned are in the gift of the lord chancellor. The principal meeting-houses for dissenters are the Calvinistic or Independent meeting-house in Broad-street, a Baptist meeting-house and a Quaker's meeting-house in Church-street, a Methodist chapel in Castle-street, and another in Minster-street, a Cudworthian and an Unitarian meeting-house in London-street, and a Catholic chapel in Vatier-lane. Another meeting-house for Baptists has also been lately erected in Sievier-street.

The town-hall and free-school form one building; the free-school occupying the ground floor, and the hall, court-room, and offices, the floor above. The free-school was established in the reign of Henry VII., by John Thorne, abbot of Reading, with the funds of a suppressed almshouse. This school has two scholarships in St. John's college, Oxford, the gift of Sir Thomas White, in 1557. Julius Palmer, one of the masters of this school, fell a martyr to his Protestant tenets in 1556. The blue-coat school, which is so named from the dress of the scholars, was founded in 1676, by Mr. Richard Aldworth, who bequeathed 4000l. for the support of a master, lecturer, and twenty boys. The present school-house is of late erection, and consists of a centre and two wings. Several donations and bequests having been made to this establishment by various persons, it now usually supports about 48 boys. The green school is situated in Broad-street, and is appropriated for the education of the daughters of decayed tradesmen, residents in the town, and of orphans, who have been left unprovided for by their parents. The inhabitants of Reading are indebted for the institution of this school to the Rev. Charles Sturges, the Rev. Dr. Nicholls, and the Hon. and Rev. W. B. Cadogan, former vicars of the three parish churches belonging to the town. It is supported by annual subscriptions, and the proceeds of different donations and bequests. In the foundation school, founded in 1765, eight male and eighteen female children are taught to read. It was instituted with a legacy left for that purpose by Mr. Joseph Neale. The school of industry originated under the patronage of Mrs. Cadogan, for female children, and is supported by the voluntary contributions of ladies in the town. The Lancasterian school, established in 1816, is situated in Southampton-street, and is attended by about 350 boys, who are nominated by the subscribers individually. The school for national education was opened in September, 1813. It is founded on the plan of instruction recommended by Dr. Bell, and is chiefly supported by the clergy of the town and county. Both these institutions are calculated to be highly beneficial to the rising generation. Besides these seminaries of education, there are in Reading several Sunday schools, all the children attending which receive a suit of clothes annually, from a fund provided by the bequest of Mr. Edward Simeon, who clothed them in the same manner during his life-time. The theatre of Reading is a neat and convenient building, lately erected, under the act for regulating provincial theatres. The gaol was built in 1793, on the site of some of the abbey ruins. It is a large edifice, and contains commodious apartments for the keeper, a neat chapel, an infirmary, and a room for the reception of the magistrates, in the centre; and two wings, one for male, and the other for female prisoners, with yards, cells for refractory individuals, &c.

Besides the above public buildings and establishments, there is a public library lately established at Reading, under the name of the "Reading Institution," also a dispensary, which is attended by one of the medical gentlemen of the town. The house is the property of the corporation, and the general expences are defrayed by subscription. The Oracle may likewise be reckoned among the public buildings of Reading. This structure was erected by the mayor and burgesses, in conformity to the will of John Kendrick, who left 7500l. "to build a strong house of brick, fit and commodious to let the poor to work therein." The funds of this charity having been at different periods greatly abused and misapplied, the subject has been several times before the supreme courts of justice. The tefator's object, in bequeathing his large legacy, was the improvement of the woollen trade; but instead of this, it was perhaps the first occasion of the decay of that manufacture, by enabling such as could obtain its advantages to underfly those who were not so fortunate. The fame complaints are made against it, with respect to the manufacture now carried on in it, and, as we suspect, not without some show of reason.

Monastic Establishments.—As already mentioned, the earliest religious institution at Reading was a monastery for nuns, founded by Elfrida, the mother-in-law of Edward the Martyr. This nunnery was founded in 979, and was destroyed, in 1009, by the Danes. The precise site on which it stood is uncertain, but there can be no doubt of its existence. It appears from the Domesday-book, and also from Tanner's Notitia, that another nunnery was established here at a later period, but nothing of its history is known. The abbey, the ruins of which are still sufficient to attest its extent and importance, was founded by Henry I. in 1121. It occupied a spot of ground, equal, if not superior, to any in Berkshire for fertility of soil and beauty of situation. This spot comprehended about thirty acres, and was environed on three sides by a massive and lofty wall, and on the fourth by the river Kennet. Exterior to this wall was a piece of ground, about fifty yards wide, (like the pomarium that surrounded the Roman cities,) which it was not allowable either to cultivate or build upon. It had four entrances to it, defended by arched gateways, and having battlements on their tops similar to those on the walls. Within these was the outer court, whence another gate-way led into the inner court. Part of this building remains, and is composed of bricks, chalk, and stone; and, from the diffimilarity of styles which it exhibits, has evidently undergone many alterations and repairs. Some of it is probably as late as the reign of Henry VII. 1 though other portions of it are, undoubtedly, of much higher antiquity. The inner court conducted to the principal entrance to the abbey; the situation of which, owing to the ground having been since built upon, and the confusion occasioned by throwing up the ramparts in the civil war, cannot now be accurately determined. The only entrance on this side at present is through an arched passage, opening into the south-east corner of the cloisters, which is certainly
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Certainly too mean to be supposed to have been the grand entrance to this superb monastery. On the right-hand of the paling is a door-way, leading to a range of apartments, and within is a circular stair-case, which conducts to the upper part of the building. This division of the abbey is conjectured to have been appropriated as offices for servants and others, as, underneath it, is a series of arched cellars, and at its southern extremity was the kitchen. The great hall, or cloister, was entered from the cloisters by three large entrance doors. It measured 80 feet in length, 46 in width, and the nave was 40 feet wide, and was divided from the side-aisles by alternate piers and arches. From the massive character of this structure, in general, and from the circular form of the windows in the dormitory, it is conjectured that its windows also had circular arches. In the ground to the east of the church, many skeletons have been discovered, a circumstance which points it out as the probable burial-place of the monks. The above-mentioned buildings constituted the body of the abbey, but there were likewise many others, both connected with and detached from them. Among those were the infirmary, the stables, and the mill. This hall is yet standing, and appropriated to its original purpose. It is a substantial edifice, built of flint and stone, and is probably coeval with the abbey-church.

Reading monastery was indubitably among the most distinguished in England. The monks were of the Benedictine order, and were endowed with many privileges and immunities, not only by the founder, but by several of his successors, and by some of the popes. They had the right of coining granted to them by king Edward III., also the right of holding three annual fairs, and a market every Sunday at Thatcham. The abbots were among those entitled mitred, and took precedence in the house of peers, next after the abbots of Glastonbury and St. Alban's. He was lord of the manor of Reading, and possessed otherwise much influence in the government of the borough. Many of the monks were distinguished for their talents and their acquirements in the learning of their respective ages. Robert of Reading, one of the first monks, was particularly famous, as being, with Adelard of Bath, the only Englishmen of their time who were masters of the Arabic language. The abbey-church was the place of sepulture of many royal and noble personages, among whom were Henry I., and his second queen, Adeliza, and probably also his first queen, Matilda; the empress Matilda, and William, eldest son of Henry II.; Constance, grand-daughter to Edward III.; Ann, countess of Warwick; Richard, earl of Cornwall, and king of the Romans; and Richard de Curtenese, natural son of Henry II. At the dissolution, the revenues of this monastery were estimated at £116l. 4s. 9d. annually, above £2,000l. according to the present value of money. The lands, of course, were seized upon by king Henry, who parcelled them off, either in gifts or in lease, to different individuals; but the monastery itself was converted into a royal palace, and continued to be occasionally occupied by our kings till its destruction during the grand rebellion, in the reigns of Charles I. and II.

The other monastic institutions in Reading, besides those already noticed, were two convents for Franciscan or Grey friars, St. Edmond's chapel, and Colney chantry. One of the convents was founded about the middle of the thirteenth century, soon after the first appearance of the Franciscan order in this country. Its original situation was on a marshy ground adjoining the Caverham road, and still called the Friary Meadow; but in 1284 the friars removed to their inefquential residence, at the western extremity of Friar-street. After the dissolution this house was appropriated as a work-house for the poor; and part of the church now forms the borough prison. This building is in the early pointed style, and has at its western end a very beautiful lancet window. The other convent stood in Castle-Airect, probably on the spot now occupied by the Methodist chapel. This institution seems to have been on a very small scale, though it is mentioned by Leland as "a fare house of Grey freres." St. Edmond's chapel stood on the rising ground, called Chapel Hill, near the borough prison. It was founded, in 1264, by Lawrence Burget, then bailiff of the town. In the civil war it was converted into a fort; and afterwards, about the year 1750, was demolished, and another chapel erected in its stead on Battle-Farm. Colney chantry was instituted by one of that family in the reign of Richard II., for the souls of king Edward III., of Thomas Colney, John Colney, and William Catour. It had distinct incumbents of its own, and was under the patronage of the corporation.

Reading has given birth to several persons of eminence. Sir Thomas White, founder of St. John's college, Oxford, is said to have been born here; but Fuller affirms that he was a native of Rickmanworth. Archibishop Laud was born in this town in 1573, having been the son of William Laud, then a clothier in Broad-Airect, who, as the archbishop himself told lord Say, had borne all offices in the corporation, save the mayoralty. John Blagrave, the mathematician, is also commonly reputed to have been a native of Reading; as was Joseph Blagrave, a celebrated astrological writer, who does not seem to have been related to the mathematician. The other distinguished natives of Reading were, Sir Thomas Hanmer, Sir John Barnard, a noted alderman of London; James Merrick, the translator of the Psalms; William Baker, a learned printer; Sir Constandine Phipps, lord chancellor of Ireland; and Dr. Phanuel Bacon, author of several dramas, &c.

The vicinity of Reading presents several objects worthy of notice. At a short distance to the southward, close to a place called Catgrove-lane, may be seen a remarkable stratum of oyster-shells, imbedded in a vein of sea-clay, at least twenty fathoms beneath the surface of a hill. This stratum is from one to two feet in thickness, and extends through a circumference of five or six acres of ground. Mixed with the shells is a considerable quantity of small teeth, apparently of fish. Caverham, formerly a seat of the Craven family, and afterwards of the Cadogans, is situated nearly opposite the town, on the north bank of the river Thames. The house was built by the earl of Cadogan, in the reign of George I., but has since undergone material alterations. In the old manor, Anne of Denmark, queen to James I., was splendidly entertained by lord Knowles, when on her journey to Bath, in 1613. At the time Charles I. was a prisoner at Windsor, the parliament, through the mediation of general Fairfax, permitted him to visit Caverham Lodge, where all his children who were in England then resided, in the custody of the earl of Northumberland. In the hamlet of Woodley is a very pleasing seat, belonging to lord Sidmouth; and two miles to the westward
wellward is another, the property of the Blgrave family.

The park is very extensive, and is noted for fine venison. South-ea., about the same distance, is White-Knites, the seat of the marquis of Blandford. Sunning, celebrated in history as having been for some time the seat of the see of Wilshire, and subsequently the site of one of the palaces of the bishops of Salisbury, is a village three miles to the eastward, on the road to Maidenhead. Leland mentions the bishop’s palace as standing in his time. It was given by bishop Gheaf, along with the manor, to queen Elizabeth, in exchange for all estates in Dorsetshire. The antiquity of this place is strongly marked by the fculptrul monuments in the church. Close to Sunning is an elegant mansion, the seat of Charles Fyl Palmer, esq. the Lyons's Magna Britannia, 4to. Berkshire, H. of England and Wales, vol. ii. by John-Britton and E. W. Brayley, 1801. The History and Antiquities of Reading, by John Mano, 4to. 1814.

From the latter work, the chief and most essential parts of this account have been obtained: and those who wish to poffess the most copious and authentic history of Reading will procure this volume.

Reading, a township of America, in Fairfield county, Connecticut, S. of Danbury adjoining. It contains 1717 inhabitants.—Also, a large township of Middlesex county, in the state of Massachusetts, incorporated in 1644, and containing 2278 inhabitants, many of whom are employed in the manufacture of shoes, from 2 to 300,000 pair being annually exported; 12 miles N. of Boston.—Also, a township of Vermont, in Windsor county, W. of Windsor, adjoining. It contains 1565 inhabitants.—Also, a beautiful poff-town, and the capital of Berkys county, Pennsylvania, situated on the N.E. tide of Schuykill river; 54 miles N.W. of Philadelphia. This town is regularly laid out, and flourishes: its inhabitants are chiefly German: the borough and township contain 3452. The public buildings are, a stone gaol, a court-houfe, an elegant church for German Lutherans, erected in 1793, a church for Calvinits, one for Roman Catholics, a meeting-houfe for Friends, and a large edifice for the public offices. In the neighbourhood are 10 fulling mills, and several iron-works: and at the distance of 10 miles, on the road to Harrisburgh, is a spring, about 15 feet deep and 30 feet wide, from which flows a copious stream, containing some fine trout. In 1795 the sum of 12,000 was voted by the county for building a stone arch bridge over the Schuykill, at this town, on the high road to Harrisburgh. N. lat. 40° 21'. W. long. 75° 55'.—Also, a township of Adams' county, in Pennsylvania, containing 752 inhabitants.

Reading. See Lectio.

Reading of a Deed. See Deed.

READINGS, in Criticism. Various readings, variæ lectiones, are the different manners of reading the text of authors in ancient manuscripts; where a diversity has arisen from the corruption of time, or the ignorance of copyists.

A great part of the business of the critics lies in settling the readings, by confronting the various readings of the several manuscripts, and considering the agreement of the words and sentences. The various readings in the bible, (see Hebrew Bibles,) and in the classic authors, are almost innumerable.

Readings are also used for a fort of commentary or gloss on a law, text, passage, or the like; to shew the sense an author takes it in, and the application he conceives to be made of it.

READINGTON, or RIDDENTON, in Geography, a town of New Jersey, in Hunterdon county; 17 miles N.W. by W. of New Brunswick. It contains 1797 inhabitants.

READ'S BAY, a road for ships on the W. coast of the island of Barbadoes, between Holetown and Speight's-town; half a mile broad. Ships may anchor here in safety, in fix to twelve fathoms water, the ground being soft oze, defended from all winds, except the west, which blows right into the bay. N. lat. 13° 7'. W. long. 59° 47'.

READSBOROUGH, or REEDSBOROUGH, a poff-town of America, in Bennington county and state of Vermont; 435 miles from Washington. It contains 410 inhabitants.

READ-AFFOREST, is where a forest, having been defulted, is again made a forest. As the foreif of Dean was, by an act of parliament in the 20th of king Charles II. See Forest.

READ-AGGRAVATION, in the Romish Ecclesiastical Law, the last monitory, published after three admonitions, and before the last excommunication.

Before they proceed to fulminate the laft excommunication, they publish an aggravation, and a re-aggravation. Frevet observes, that in France the minister is not allowed to come to re-aggravation, without the permission of the bishop or official, as well as that of the lay judge. See Excommunication.

READAH, in Geography, a town of Syria, in the pachalic of Aleppo, situated in a country that abounds with olives, of which considerable quantities are prepared, and sent to Perfa and other parts. This is the residence of an Aga; 36 miles S.S. W. of Aleppo.

REAL, RÃ£LE, is applied to a being that actually exists; in which sense it coincides with actual.

REAL, in Law, is opposed to personal.

REAL ACTION, that by which the plaintiff lays title to land, &c. See Action.

Customs are said to be real; that is, they determine all inheritances within their extent; and none may dispose of them, but according to the conditions allowed by the customs where they are situate.

REAL ALTITUDE, afefts, character, chattals, covenant, distinction, dieresis, elate, horizon, optical plane, patronage, privileges, qualities, root, services, suit, and seale. See the several substantives.

REAL, in Commerce, a Spanish money of account, of which there are four different forts. The real vellon is that which is most general; it consists of 5½ quarts, 17 ochovas, or 34 Maravedis vellon. Madrid, and the whole of Calife, with most of the adjacent provinces, and to Bilboa, Malaga, and Galicia, keep accounts in reals and Maravedis vellon. The real of new plate (real de plata nueva, or provincial) is double the real vellon; it is worth 17 quarts, or 34 ochovas; and it is also reckoned at 34 Maravedis of new plate. This real is represented by an effective coin of baffe silver, but books are not kept in any part of Spain in this money.

The real of old plate (real de plata antigua), mostly called the real of plate, is chiefly used in foreign commerce and exchanges; it is worth 10 quarts, or 32 ochovas; and it is also reckoned at 34 Maravedis of old plate. Cadiz and Seville keep accounts in reals and Maravedis of old plate.

The real of Mexican plate (real de plata Mexico) is used in transactions with Spanish America, where accounts are mostly kept in hard dollars, reals, and quarters, and sometimes in sixteenths; 8 Mexican reals make 1 hard dollar (peño duro); this coin is worth 10 reals of new plate, 10½ reals of old plate, or 20 reals vellon. Thus, 1 realse of new plate = 2 reals vellon; and 4 reals Mexican
can = 5 reals of new plate: 64 Mexican reals = 85 reals of old plate: 2 Mexican reals = 5 reals vellon: 16 reals of new plate = 17 reals of old plate: 17 reals of old plate = 32 vellon. The pilote of exchange (dobloun de plata) is worth 32 reals of old plate, or 60 reals 8 Maravedis vellon. The dollar of exchange (pecho de plata) is worth 8 reals of old plate, or 15 reals 2 Maravedis vellon. The duet of exchange (ducado de plata) is worth 11 reals 1 Maravedi of old plate, or 20 reals 2 1/2 Maravedis vellon. But, in commercial transactions within the country, the dobloun is reckoned only at 60, the pecho at 15, and the duet at 11 reals vellon.

The coins now current in Spain are as follow:

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<th>Reals</th>
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In gold.—The dobloun of 8 escudos (or quadruple pilote)

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In silver.—The dollar, or pecho duro (or double pilote)

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In base silver.—The peceta Mexicana (or the real of Mexican plate)

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In copper.—The piece of two quarts

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From 1730 to 1772, the gold was 22 carats, and the silver 11 dineros fine. In 1786 the standard of the gold was again reduced to 21 carats for the different doblouns and their divisions; and to 20½ carats for the coronilla or vein-

For the assay, weight, value, &c. of gold coins, see Pistoie.

Real, or Reali, is also a money of account at Leghorn. At Zante, and also Cefalonía and Corfu, accounts are kept in reali, of 10 lire, or 100 soldi, also called aspri.

Real is the name of a kind of boat in some places.

Real or Novita, in Geography. See Novita.

Real Nuevo, a town of Mexico, in the province of New Biscay; 120 miles N.W. of Parral. N. lat. 29° 10', W. long. 107° 20'.
Upon an examination, which had like to have cost M. Homberg dear, he found it to be a kind of realgar, or red arsenic, much more caustic than our's.

Its use among the Siamese, he takes to have been the same with that of regular of antimony; viz. to give an emetic quality to the wine drunk out of it.

As the dose of medicines is much stronger in the torrid zone than among us (the quantity of ipecacuana, e. gr. ordinarily taken by the Indians, being twenty times as great as that among us), it is very possible a cup of realgar, though not so potent an European, may prove a gentle medicine to a Siamese.

REALJO, in Geography, a small island in the Pacific ocean, near the coast of Popayan. N. lat. 4° 16'.

REALIZE, in Commerce, a term little known in trade before the year 1719, when those immense fortunes began to be made in France and England, by the buiness of actions or flocks.

By realizing is meant the precaution many of those who had gained most, took, to convert their paper into real effects; as lands, houses, rich moveables, jewels, plate; but, above all, into current species. A precaution capable of ruining the state; but the French regency had the wisdom to frustrate it, by taking proper measures to have the money, thus ready to be hoarded up, returned to the public.

REALISTS, REALISTAE, a sect of school-philosophers who followed the doctrine of Aristotle with respect to universal ideas, formed in opposition to the Nominalists, (see that article,) who embraced the hypothesis of Zeno and the Stoics upon that perplexed and intricate subjed.

Aristotle held, against Plato, that, previous to, and independent of, matter, there were no universal ideas or effences; and that the ideas or exemplars which the latter supposed to have existed in the divine Mind, and to have been the models of all created things, had been eternally impressed upon matter, and were coeval with, and inherent in, their objects. Zeno and his followers, departing both from the Platonic and Aristotelian systems, maintained, that these pretended universals had neither form nor effence, and were no more than mere terms and nominal representations of their particular objects.

Under the Realists are included the Scotists, Thomists, and all excepting the followers of Occam.

Their distinguishing tenet is, that universals are realities, and have an actual existence, out of an idea and an imagination; or, as they express it in the school-language, a parte rei; whereas the Nominalists contend, that they exist only in the mind, and are only ideas, or manners of conceiving things.

Doctor Odo, or Oudard, a native of Orleans, afterwards abbot of St. Martin de Tournay, was the chief of the sect of the Realists. He wrote three books of dialectics, where, on the principles of Boethius and the ancients, he maintained that the object of that art is things, not words; whence the sect took its rile and name.

REALITY, REALITAS, in the Schools, a diminutive of res, thing, first used by the Scotists to denote a thing which may exist of itself, or which has a full and absolute being of itself, and is not considered as a part of any other.

Yet a reality is conceived as something less than res; and accordingly every rei is supposed to contain a number of realities, which they otherwise call formalities.

Thus, e. gr. in a man, according to the doctrine of the Scotists, are a number of realities; viz. a substance, life, animal, and reason.
REA

Some distinguishing reality into subjective and objective.

REALM, REGNUM, Kingdom, a country which gives its head or governor the denomination of king.

The word is formed of the French royaume, which denotes the same.

REALMONT, in Geography, a town of France, in the department of the Tarn, and chief place of a canton, in the district of Albay; 9 miles S. of Albay. The place contains 2247, and the canton 8940 inhabitants, on a territory of 2275 square miles, in 19 parishes.

REALVILLE, a town of France, in the department of the Lot; 8 miles N. E. of Montauban. N. lat. 44° 6'.

E. long. 1° 34'.

REALMIA, a town of the Arabian Irak; 10 miles W. of Ballora.

REAMO, a town of Naples, in Abruzzo Ultra; 6 miles W. N. W. of Teramo.

REAMUR, a town of France, in the department of the Vendée; 18 miles N. of Fontenay le Comte.

REANG, a town of Bengal; 45 miles S. of Silhet.

REAPER, a person whole business it is to reap or cut grain.

REAPING, the operation of cutting crops by means of the fickle. It is a very laborious sort of field-work, and one which requires considerable attention and care to perform it in a neat and exact manner. Reaping is performed with some other sorts of crops, besides those of the grain kinds; as occasionally for peas, beans, flax, and others of a similar nature. Work of this nature is executed in many different ways, according to the differences in the customs of different districts; as by sets of men hired by the month, for this particular purpose, called reaper-men; by persons taking it by the piece, or by the acre, and by the sheaf or fshoek of eight sheaves.

In some methods, the piece or the quantity is unquestionably the best, in most cases, on account of the very high prices which are exacted at this very busy season, and the very small extent of labour which is performed in working by the day, which cannot be controlled by the farmer at such hurrying times. Besides, the work is, for the most part, the belt and most expensively performed in these ways; which are objects of very great importance, and deserving of much consideration in this sort of business. The eye of the farmer is, however, constantly necessary to see that all goes on in a right manner.

In the northern parts of Lancashire, this sort of labour is mostly performed by the day, or the hattack of ten sheaves, or the flshoek of twelve sheaves; three-pence being often paid for the former, and four-pence or five-pence for the latter, in these places.

In some districts, the reaping of the crops commences before they are quite ripe; but in others, not until this has fully taken place.

REAPING of Corn, the practice of cutting it with the fickle, or otherwise, by persons employed for the purpose. It may be observed, that the business of reaping or cutting grain crops differs much in the manner of performing the work, in different districts of the kingdom, and kinds of crops. In the more southern parts of the island, the crops of this sort are mostly cut by means of short flshy scythes, made for the purpose, having bows formed of bent sticks, or what in some places are termed caddles, fixed upon the lower parts of the handles, for the more readily depositing the ears or heads of the corn in one uniform direction, as much as possible, in order that it may be afterwards bound up into sheaves. But in other cases, the naked scythe is made use of; the corn being seldom bound up, being simply raked together into small heaps, in a similar manner to hay.

In the more northern parts of England, and in Scotland, the reaping of grain crops is, however, in general performed by the fickle, or reaping hook; the different handtools, as soon as cut, being deposited upon hands, formed by twirling together a few flshes of the corn at the ends next the ears, and afterwards bound up into sheaves, in order to their being let up into flocks or batches. This method is, in most instances, adopted with the wheat and rye crops, in every part of the island; as in cutting them with the scythe, it is difficult to be performed without much loss being fullfilled by the shedding of the grain. And, in addition, it is of great advantage to have these sorts of crops bound up regularly into sheaves, the straw being much better.

Besides these, there is another mode sometimes practised, which is by means of a hook with a sharp edge, without any teeth; the labourer, in executing the work, hooking up the corn towards his. It is mostly made use of in the southern districts, where it is known by the name of bagging, the grain in this way being cut very low.

In this way the reaper collects enough for one sheaf at a time, binds it, and puts it up in tons, called a flock in Middlesex. This bagging (or bagging) practice is to all intents and purposes, mowing with one hand against the standing corn. The toothless hook, employed in doing it, is of nearly twice the weight of the common scythe. It is sharpened occasionally, when necessary, in the manner of the scythe; and the operation of cutting the crop down is by a succession of blows made upon the flax of the standing grain, very nearly in the direction down towards the surface of the ground. Reaping in Middlesex is mostly all done in this way, as the proper use of the scythe is but little known.

This method has the advantage of being done closer, and with equal or more expedition than the hand-reaping mode, besides the saving in flax, which is here supposed worth 2s. the acre.

In Essex wheat crops are generally reaped or cut with the fickle, though in the vicinity of the metropolis it is not uncommon to have it mown with the scythe, as close to the ground as other sorts of grain crops, in the view of increasing the quantity of flax, which is there very valuable. It is thrown, in these cases, with great skill and dexterity into swathes. When perfectly ripe, it is soon bound up into sheaves of six or eight inches diameter, with bands of wheat-flax of single or double lengths; but when not in this ripe or dry flax, it is allowed to remain in the swaths two or three days, as necessary. However, in more than three quarters of the county, it is reaped or cut with the fickle; and indeed in almost all places, when beaten down by the wind and rain.

In regard to the time of reaping the grain, there is considerable difference in different districts; some not reaping it until it is quite ripe, while others cut it when something short of this late. This, however, should probably be regulated by the nature of the season, and the kind flax or quality of the crop, as well as the use to which the grain is to be put.

In respect to the manner of reaping grain crops, whether the fickle or scythe be employed for the purpose, there is much difference in the height at which the crops are cut in different places. In some it is the practice to have the business performed in as close a manner as possible; while in others a flub of eight, ten, and fifteen inches; or more,
is left. These different practices have their advocates; one party supposing that the work proceeds more slowly, where it is executed in so close a manner; while the other contend that the contrary is the case. But as the flubbe which is left is not only useless to the land, but in many cases very troublesome in its succeeding culture, being frequently under the necessity of being removed, it would seem to be the best as well as cheapest practice, to have the busi-
nesses constantly executed in a close manner. It has been ob-
 served by a late practical writer, that by this means the agricul-
tor will not only have more litter at command, for the
bedding of his yards, flalls, and other places, and conse-
sequently an increase of manure, but have the businees more
expeditiously performed, with much less waste of grain, and at the same time be freed from the trouble and expence of removing the flubbe. It has indeed been fully flown,
by a careful trial, made with the view of ascertaining the
difference between high and low reaping, that the advantage
is considerably in favour of the close method.

And the result of the trial is thus stated by the writer of
the Agricultural Survey of the West Riding of Yorkshire,
who observes that the experiment was made upon part of a
field of wheat, two ridges of which were cut close by the
ground, and the other two considerabily higher, though not
to high as the general run of the Yorkshire flubbes. Each
of the divisions was apparently of equal quality, and mea-
sured a trifle more than a quarter of a Scotch acre, which is
about one-fifth larger than the English statute acre. The
crop was flacked separately, and the time taken to cut
was one hour and twenty-four minutes, of eight
heares; while the high cutting was performed by the same
number of hands in forty-eight minutes. The wages paid
that week were 15d. per day, and the supposed expe-
cence of maintenance 6d. or 2s. per day altogether. When threified,
the grain and straw were carefully measured and weighed,
and the result of the experiment was as follows:

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<tr>
<td>per day, or 22½d. per hour</td>
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<tr>
<td>The same hands in 48 minutes</td>
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| Difference of expe-
cnce |                                            |

In favour of high cutting one shilling, or four shillings

per acre.

£ 1 6
1½ peck of wheat more upon the low cut
ridges than those cut high, at 1s. 4d. per
peck

£ 0 1 8
14 flones (22 avoirdupois pounds) of more
straw, 3 d. per Rone

£ 0 1 0
Or sixteen shillings per Scotch acre.

From which deduced the increased expe-
cnce of cutting, there remains a benefit of twelve shillings per acre in favour
of low cutting.

It is noticed farther, that the above trial, according
to the belt of the reporter's judgment, was fairly made; and the
reason which urged him to make it, was to silence the
objections of some neighbours, who alleged low hearers
was not profitable. It is also proper to observe, that the
field of wheat, on which the trial was made, was not broke
down nor irraggled, so was in a favourable condition for
high cutting. We have seen wheat-fields, where three times
the quantity might have been left, unless great pains were
used.

But the methods of reaping grain crops, both with the
tickle and the scythe, have each their advantages and disad-
vantages. In the first manner, the crops are deposited with
more regularity and exactness, and consequently bound into
sheaves with greater facility and dispatch. Beside, in many
cases less loss is incurred by shedding, in the time the work is
in performing; but the labour is executed with greater diffi-
culty and trouble. The latter posseis the superiority of
being more expeditious, and of being performed to any de-
gree of closeinets that may be required; while it has the evi-
dent disadvantage of leaving the cut grain in a more irregular
and uneven situation, by which it is rendered less fit for
being bound up into sheaves, which in many cases is an in-
convenience of great consequence. When the grain has
attained a high degree of ripeness, there may likewise be great
loss sustained, by its being laid during the operation, in
this way of reaping and cutting the crop. Where this
method is practiced, it is, however, not unfrequently the case
to have it bound into sheaves; though the most common
custom is to let it remain in the rows or swathes, till fit for
being put into the flack. When bound, it is generally the
practice to cut it downwards against the crop on which it rests:
in the other case, it is cut in the manner of grafs for hay.
It is obvious, therefore, that when labourers are procured
with difficulty, this mode of reaping is the most advisable;
while, under the contrary circumstances, the former may be
had recourse to with more advantages, as the work may be ex-
ecuted in a nearer and more exact way. See Har-
vesting and Sickle.

It may be remarked, that this is a sort of work that is
often let by the acre to persons that go about for harvest
work; and it may, in many cases, be the belt performed in
this manner. But great attention should be paid by the
farmer, to see that the grain is cut and bound up in a pro-
per method, and that the work be not performed in improper
weather. The prices vary according to the nature of the
crops, the season, and other circumstances, sometimes rising
as high as eleven or twelve shillings the acre, and sometimes
much higher.

Reaping Fork, a tool of the fork kind, invented for the
purpose of raising and collecting the mown grain into
sheaves, so that it may be bound up. It is constructed
with two, rather long, prongs below, lightly curving up-
ward, somewhat in the manner of the common large hay
fork, to which are attached, at the upper part, near the in-
sertion into the handle, two other upright prongs, which
bend a little forward towards their tops or ends; by means of
which, with the under prongs running along the ground,
the tool being pushed forward by the labourer, the grain is
the flack is raised up, brought together, held in a firm
manner, and removed from the swathe so as to be bound
into sheaves. In this way, the lower prongs perform the
work of picking the flakewv material from the land, while
the higher upright ones prevent it from falling backwards,
and determine the quantity which is necessary for a sheaf.
In this manner, by this simple contrivance, the mown grain
can be brought together and bound up with much greater
regularity, and in a much more expeditious method than is
possible to be done by mere hand labour.

Reaping Hook, an implement of the tickle kind, with
which the busines of reaping is performed in some districts.
These hooks are sometimes formed with teeth, or in a
toothed manner, and sometimes with a cutting edge. In
Devonshire, and some other counties, those with smooth
edges are generally preferred to sickles with sawed ones:
thee sorts of hooks are used occasionally with either hand, the operator shifting hands, chopping the straw low down, and gathering about half a sheaf at a time, which, when put together, is bound with reed, combed from former wheat-straw, or with a double length of the wheat which is reaping. See Sickle.

Reaping Machine, a contrivance for the purpose of reaping grain by means of animal labour. With this view, and to facilitate an operation of such importance to the farmer, different attempts have been made to construct machines, so as to dispatch the work in a rapid manner by the assistance of horse labour, but the successes which with which they have been attended, has hitherto been far from complete. An implement of this sort has lately been made by Mr. Plunkett; it is upon a somewhat new principle, the horse drawing the machine instead of pulling it forward, as was the old mode of applying the power.

In this machine, the horse tracks from the front side of it, which is seen at once by the appearance of the implement, so as to be clear of the crop, and the two large wheels, by means of the axle, drive another wheel, which communicates with the two other wheels, the latter of which is found in the axis of the cutter: a man at the handles regulates the direction, &c. This machine may be seen fully represented in the second volume of the Farmer's Dictionary; and a reaping machine for clover may be seen in the same work in the same plate.

Other machines of this kind have still more lately been invented by other persons, but without answering the purpose in that full and complete manner which is necessary in this sort of work.

What appears to be chiefly wanting in these sorts of machines, to render them complete and effectual, as tools for the purpose of reaping, is that of their having more power or velocity in the cutting parts, so that the work may be performed in a perfectly clean neat manner, without the straw being drove or forced down in an improper manner before the instruments which are to cut it; their cutting it out fully in the whole of its breadth; their being capable of being regulated to cut at different heights, and to different breadths; their being made capable of directing the cut strawy grain all in one even regular direction, so that it may be bound up with facility; the horses, or other animals, being so attached to them as to permit of their walking along on the side of the standing grain, where the former cut was made, or where they pull the implements before them, the leaving them so conveniently fixed in them as to admit of no fear of interruption to the labour in any way; their being made light and of ready application, as well as at a cheap rate; and their keeping the feythes or cutting parts in a perfectly sharp state, without their being taken out, and undergoing the operation of whetting. There are, besides these, some other points, which should be attended to, but these are, probably, the most material.

REAPS, small parcels of corn, laid along on the flabb of, in reaping, to be afterwards gathered into sheaves by the binder. This is most commonly the cafe, when the weather is moist, as in dry times the reaps of corn are usually laid in the bands, and tied up, as soon as they are in sufficient quantity, into sheaves.

REAR, a term frequently used in composition, to denote something behind or backward in respect of another; in opposition to van, or avant, before.

It is formed by corruption of the French arriere, signifying the same.

REAR, in a Military Sense, is used for the hind-part of an army, &c. in opposition to the front, or face of it.

REAR, in Naval Language, is a name given to the last division of a squadron, or the last squadron of a fleet, and which is accordingly commanded by a rear-admiral, or the third officer of the said fleet or squadron.

REAR-admiral. See Admiral.

REAR-guard. See Guard.

REAR-half-sheets, are the three hindmost ranks of a battalion, when it is drawn up in deep. See File-leaders.

REAR-line of an army encamped, is always twelve hundred feet at least from the centre line, both of which run parallel to the front line, and also to the referve.

REAR-rank, is the last rank of a battalion, or squadron, when drawn up, and generally sixteen or eighteen feet from the centre line, when drawn up in open order.

REAR-va, in the Manege, chelled in French, is the action of a horse, when he raises himself upon his houghs or binder legs, as if he would fall quite over in a backward direction, to the great danger of his rider. This is often caused by his having too much of the curb.

REAR, in Rural Economy, to raise the roof part of any sort of shed or other building for containing some kind of live-stock.

REARED, or Well-REARED. See Wale-reared.

REARING ANIMALS, in Agriculture and Rural Economy, the busines of breeding and bringing them up to the most suitable states for the purposes of the farmer. The principles of this art depend upon a variety of different circumstancies and kinds of knowledge, as has been already explained. See Breeding, and Live-Stock.

Animals of the horse kind should invariably be brought up in the best manner, without any sort of flitting in their food, according to the ufed they are designed to serve, in order that they may have their full growth and power. In the labouring cattle kinds of animals, attention should, in some degree, be paid to hardines, both in their food and their exposure, by having recourse to the more coarsé forts of feeding in the less sheltered situations, but nothing of flitting should ever be allowed, as by these means they become large, and capable of sustaining a greater degree of exertion. There is, likewise, much utility in good training, in rearing all forts of animals in this intention; and it requires careful, ready, mild persons to be employed in it, as they, for the most part, acquire the habits and dispositions of those about them, in some measure; and the more early they are obtained the better. This point deserves much more attention from farmers and others than it has hitherto met with, as one of the chief habits of working animals arise from the neglect of it. Besides, good training and mild dispositions are highly favourable to fattening animals. See Horse.

In rearing poultry, pigeons, rabbits, and fish, much care, management, and circumspection, are constantly necessary, in order to their perfect success. Too little attention is for the most part bestowed on the nature of the birds, in some forts of the more wild poultry kinds, as those which are of the game description, for instance, the galena, the pheasant, the swan, and some others. These cannot be so readily reared, or with so much facility, under hands of the domestic kind, as other sorts are, such as the turkey, peacock, &c. This circumstance should therefore be always kept in mind in rearing such birds. See Poultry, Pigeons, Rabbit, &c.

A very nice attention and management is also requisite in the rearing and perfecting of fish. See Fish, Pond-Fisheries, and Salmon Fishery.

In rearing birds of the game kind, such as the above, in the way of ornament about a residence, Mr. Loudon has remarked, much depends upon encouraging them, when al-
lowed to go wild, by giving them proper and abundant cover, and flowing among fig herbs and plants as they are particularly fond of, as those of the cress, chervil, parsley, thyme, and some other kinds. They have likewise a tendency to encourage and domesticate hares. Abundance of fear lends game about a residence, he thinks, give peculiare nobleness, and appearance of freedom, which few things else can communicate or afford.

REASON, Ratio, a faculty or power of the soul, by which it distinguishes good from evil, and truth from fallacy. Or, reason is that principle, by which, comparing several ideas together, we draw consequences from the relations they are found to have.

Some of the later school-philosophers define reason to be the comprehension of many principles which the mind successively can conceive and from which conclusions may be drawn.

Others conceive reason as no other than the understanding itself, considered as it discourses.

Reason, Mr. Locke observes, comprehends two distinct faculties of the mind; viz. sagacity, by which it finds intermediate ideas; and illusion, by which it so orders and disposes of them, as to discover what connection there is in each link of the chain, by which the extremes are held together; and by them, as it were, draws into view the truth sought for.

Illusion, or inference, consists in nothing but the perception of the connection there is between the ideas in each step of the deduction, by which the mind comes to see either the certain agreement or disagreement of any two ideas; as in demonstration, in which it arrives at knowledge; or their probable connection, on which it gives or withholds its assent; as in opinion.

Sense and intuition reach but a little way; the greatest part of our knowledge depends upon deductions, and intermediate ideas. In those cases, where we must take propositions for true, without being certain of their being so, we have need to find out, examine, and compare, the grounds of their probability; in both cases, the faculty which finds out the means, and rightly applies them to discover certainty in the one, and probability in the other, is that which we call reason.

In reason, therefore, we may consider four degrees; first, the discovering and finding out of proofs. See Invention.

Secondly, the regular and methodical disposition of them, and laying them in such order, as that their connection may be plainly perceived. See Method.

Thirdly, the perceiving of their connection (see Judgment.) And,

Fourthly, the making a right conclusion.

Reason fails us in several instances; as, first, where our ideas fail.

Secondly, it is often at a loss, because of the obscurity, confusion, or imperfectness, of the ideas it is employed about. Thus, having no perfect idea of the least extension of matter, nor of infinity, we are at a loss about the divisibility of matter.

Thirdly, our reason is often at a stand, because it perceives not those ideas which would serve to shew the certain or probable agreement or disagreement of any two other ideas.

Fourthly, our reason is often engaged in absurdities and difficulties, by proceeding upon false principles, which, being followed, lead men into contradictions to themselves, and inconsistency in their own thoughts.

Fifthly, dubious words, and uncertain signs, often puzzle men's reason, and bring them to a nonplus.

Though the deducting one proposition from another be a great part of the office of reason, and that about which it is usually employed; yet the principal act of reasoning is the finding the agreement or disagreement of the ideas one with another, by the intervention of a third. As a man, by a yard, finds two houses to be of the same length, which could not be brought together to measure their equality by juxta-position. Words have their consequences as the signs of such ideas and things agree or disagree with what they really are; but we observe it only by our ideas.

Hence we may be able to form an idea of that ordinary diffinition of things, into such as are according to, those that are above, and those contrary to reason.

Those according to reason are such propositions, whose truth we can discover by examining and tracing those ideas we have from sensation and reflection, and by natural deduction find to be true or probable.

Those above reason are such propositions, whose truth or probability we cannot by reason derive from those principles.

Those contrary to reason are such propositions as are inconsistent with, or irreconcilable to, our clear and distinct ideas.

Thus the existence of God, is according to reason; the existence of more than one God, is contrary to reason; and the resurrection of the body after death, above reason.

Above reason may be also taken in a double sense; viz. above probability or above certainty.

They who dispute most about the power and privileges of human reason, do it because their own reason persuades them to that belief; and so, whether the victory be on their or our side, they are equally defeated.

They seek to terrify us with the example of many great wits, who, by following this ignis fatua (so they call the only pole-star God has given us to direct our course by), have fallen into wild and ridiculous opinions, and increased the catalogue of heresies to a great number; but these men either followed not their reason, but made it follow their will; or else they first hoodwinked it by interest and prejudice, and then bade it shew them the way; or were wanting in those necessary diligences required for so doubtful a passage; or if, without any of these, the weakens of their understanding had deceived them, the error is neither hurtful to themselves, nor would be to others, if this doctrine of governing ourselves by our own reason, and not by authority and example, were generally establised. Dis. Concern. Hum. Real.

It is not the use of such liberty, but the appropriating it to ourselves, that is the cause of all the disorders charged upon it; for those who lay a restraint on other men's reason, have first made use of their own to settle them, and to make use of it in this very restraining of others. Ibid.

Reason, in Matters of Religion, is used in opposition to faith.

This use of the word, Mr. Locke takes to be in itself very improper; for faith is nothing but a firm assent of the mind; which, if it be regulated, as it is our duty, cannot be afforded to any thing but upon good reason, and so cannot be opposite to it.

He that believes without having any reason for believing, may be in love with his own fancies; but he neither sees truth as he ought, nor pays the proper obedience due to his Maker, who would have him use those differing faculties he has given him, to keep him out of mistake and error.
But since reason and faith are by some men opposed to one another, it may be necessary to consider them together.

Reason, as contradistinguished to faith, is the discovery of the certainty or probability of such propositions, or truths, which has not by the use of its natural faculties; viz. by sensation, or reflection.

Faith, on the other hand, is the assent to any proposition upon the credit of the proponer, as coming immediately from God; which we call revelation, which fee.

Reason, in Logic and Rhetoric, denotes a necessary or probable argument; or an answer to the question, *why is it?*

As if it be inquired, why do the subject and predicate agree? and it is answered, because they are spoken of the same thing: this latter enunciation is a reason. Hence, say the schoolmen, because *qua* is the sign or character of a reason, as *non*, *no*, of a negation, and *est*, *is*, of an affirmation.

They make three kinds of reasons, *rationes; viz. ratio ut, that is, left; and quia, because.* For, answering to a question, *cur aed *, we begin with because, *qua* is: why do you fludy? that I may become learned; which is the *ratio ut.* Again, why do you fludy? left I shoul be ignorant; which is the *ratio ne.* Lastly, why is a body tangible? because matter is impenetrable; which is the *ratio quia*.

The *reason ut* properly denotes the end, or final cause; and the *reason ne* the beginning; accordingly the one is called the beginning, the other end: so that the *reason quia* is left the only reason, properly so called.

Reason, among *Metaphysicians*, is used in the same sense with offence; or that by which any thing is it.

This is sometimes also called formal reason, as representing the thing under that form or nature under which it is conceived.


Reason of State, *Ratio Status*, in Matters of Policy, denotes a rule or maxim, whether it be good or evil, which may be of service to the state.

The phrase is borrowed from the Italians, who first used *ragione di stato* in this sense.

Reason of state is properly understood of something that is necessary and expedient for the interest of the government, but contrary to moral honesty, or justice.

Politicians have a long time disputed about the *ratio statut*; whether states and governments are tied down to the same laws of morality with individual persons; or whether things, otherwise immoral and unlawful, may be practiced on urgent occasions, by way of reason of state?

The question is, whether any thing be unlawful, or prohibited a state, that is necessary to the preservation of that state, or whether it be allowed to preserve itself on any terms?

Reason, Challenge upon. See CHALLENGE.

Reason sufficient of Leibnitz. See LEIBNITZIAN Philosophy.

Reasonable Aid, a duty which the lord of the manor, or of his tenants, holding in knight's service, or on socage, towards the marrying his daughter, or the making his eldest son knight.

This is taken away by *flat. 2 Car. II.* See Aid.

Reasoning, Ratiocination, the exercise of that faculty of the mind called reason: or, it is reason deduced into discourse; which fee.

The agreement or disagreement of two ideas does not appear from the bare consideration of the ideas themselves, unless some third be called in, and compared, either sepa-rately, or conjointly with it; the act, then, by which, from ideas thus disposed and compared, we judge this or that to be so, or not so, is called reasoning. Or, it is that operation of the mind, by which we infer one thing, i. e. one proposition from two or more propositions premised. Or, again, it is the drawing of a conclusion, which before was either unknown, or dark, or doubtful, from some propositions which are more known and evident. It is the narrowness of the human mind which introduces the necessity of reasoning; for if the mere perception and comparison of two ideas would always teach us whether they agree or diverge, then all rational propositions would be matters of intelligence, or first principles, and there would be no use of reasoning, or drawing any conclusions. But when we are unable to judge of the truth or falsehood of a proposition in an immediate manner, by the mere contemplation of its subject and predicate, we are then constrained to use a medium, and to compare each of them with some third idea, that by seeing how far they agree or disagree with it, we may be able to judge how far they agree or disagree among themselves. Watt's Logic, part iii. chap. 1.

Rohault defines reasoning to be a judgment depending on some antecedent judgment: thus, having judged that no even number can be composed of five uneven numbers, and that ten is an even number; to conclude, that ten cannot be divided into five uneven parts, is a ratiocination, or reasoning.

This agrees with father Malebranche's doctrine, one of the great points of which is, that reasoning, on the part of the underlinding, is only a mere perceiving.

That ingenious author endeavours to shew, that, as to the understanding, there is no difference between a simple perception, a judgment, and a reasoning, except in this, that the understanding perceives a simple thing without any relation to any thing else, by a simple perception; that it perceives the relations between two or more things in a judgment; and, lastly, that it perceives the relations that are between the relations of things, in a reasoning. So that all the operations of the understanding are no more than mere perceptions.

Thus, *a. gr.* when we conclude, that 4 being less than 6, twice 2 being equal to 4, are of consequence less than 6, we do no more than perceive the relation of the inequality between the relation of twice 2 and 4, and the relation of 4 and 6.

The manner of proceeding judiciously in reasoning; so as to arrive with the greater safety at the knowledge of truth, makes what we call method.

For the real benefit of logic to reasoning, see Logic and SYLLOGISM.

RE-ATTACHMENT, in Law, a second attachment of him who was formerly attached, and dismissed the court without day, by not coming of the justices, or the like casually.

Brook makes re-attachment either *general* or *special*. General is where a man is re-attached for his appearance on all writs of affize lying against him: *special*, for one or more certain writs.

REAU, in Geography, a town of Germany, in the principality of Culmbach; 9 miles s.e. of Hof.

REAVE, in Rural Economy, a provincial term, used to signify the unroofing or disturbing the thatch or other covering of a building by winds, &c.

REAUOR, RENÉ-ANTOINE FERCHAULT, SIEUR DE, in Biography, was born in 1683 at Rochelle. He was brought up to the study of the law, which he quitted for that
that of the mathematicians, natural history, and natural philosophy. In 1703 he went to Paris, and so distinguished himself in a few years, that in 1708 he was admitted into the Academy of Sciences. From that time he entirely gave himself up to the pursuits of natural history in all its branches, and few men have paved a life more actively and usefully employed. Utility was the dominant aim in all his enquiries, even into the most minute parts of nature; and experiment and observation were his perpetual guides. No one surpassed him in the patient industry with which he observed natural phenomena, or followed the progress of art.

The memoirs of the Academy of Sciences, from 1709 to 1756, are enriched with his communications. The improvement of manufactures was also an object of his attention. In 1722 he published a work, entitled "L'Art de convertir le Fer forgé en Acier, et l'Art d'adoucir le Fer fondu," which contained a minute and scientific account of the processes employed in that branch of manufacture, with hints for their improvement. He introduced into France the manufacture of iron, which article had before been imported from abroad; and he made a great many experiments in the manufacture of porcelain, which contributed to its perfection in France. He also performed numerous experiments relative to the art of hatchling chickens by artificial heat, as practiced in Egypt, an account of which he published in two vols. 1752. M. Réaumur rendered his name celebrated by his peculiar method of graduation on the thermometer, which is still the only one used in France and many parts of the continent. In this thermometer the freezing point is marked zero, and the boiling point at 80°.

(See Thermometer.) Some of the most valuable of Réaumur's physiological experiments were those relating to the concave powers of the stomach in granivorous and carnivorous birds, in which he clearly established the different modes of action in these two classes, viz. by trituration, and by solution. In natural history, he acquired the greatest fame as an entomologist. Besides a number of curious papers on this subject in the memoirs of the Academy, he published a very elaborate work, entitled "Mémoires pour servir à Histoire Naturelle des Insectes," in six vols. 4to. 1734-1742. This work was the labour of many years, and the result of innumerable observations made in his garden, in which he kept insects of all kinds, that he might examine their generation, changes, and mode of life. Réaumur was a man of much private worth, of mild and amiable manners, and correct morals. He died in 1757, at the age of 75. He bequeathed his manuscripts, and cabinet of natural philosophy, to the Academy of Sciences.

REAUAMUR, in Botany, so called in honour of the great French naturalist, René Antoine Ferchault de Réaumur, principally known, as a botanist, by his examination of the fructification of Fuci, but chiefly celebrated as a philosophical inquirer into the history of insects, and their transformations, to which the specific name of the original species, vermiculata, evidently alludes. Linnaeus mentions Haflequint as the author of the name Reaumur; of which we can find no traces in his book, though the specimen of the plant in the Linnaean herbarium, has some appearance of having been gathered by this distinguished Oriental traveller. Is it possible, that the Anonima dubia, n. 15, of his Iter Palatinum, 405, which his editor Linnaeus could not make out, can be the Réaumur? The description is not inapplicable, except what concerns the flaminus and style. Yet this does not make him the author of the name, though it may possibly account for Linnaeus's mention of him in conjunction therewith. The latter appears, by his manuscripts, to have once defined Vermiculata for the generic appellation.—Linn. Gen. 276. Schrebb. 371. Willd. Sp. Pl. v. 2. 1249. Mart. Mill. Dict. v. 4. Witt. Hort. Kew. v. 3. 537. Jaff. 316. Lamarck Illus. t. 489. Dict. v. 6. 84. —Clais and order, Polyandra Pentagyna. Nat. Ord. succenture. Linn. Ficoides, Jaff.

Gen. Ch. Cal. Perianth inferior, of five prominent, ovate, pointed, permanent leaves. Cor. Petals five, oblong, equal, fertile, rather longer than the calyx, oblique, or lobed, at the extremity. Nectary of five double, fringed scales, at the meeting of the petals, attached to their lower part. Stam. Filaments numerous, capillary, the length of the calyx, inserted into the receptacle; Desfont.; anthers roundish, incumbent. Petl. German superior, roundish; styles five, thread-haired, erect, approaching each other, on a level with the flaminus, stigmata simple. Peric. Capsule ovate, of five cells, with five flat, at length reflexed, valves; the partitions membranous, unconnected, deciduous. Seeds several, erect, oblong, entirely clothed with numerous, filiky, simple hairs, twice their own length.

Eff. Ch. Calyx of five leaves. Petals five, with ten fringed scales at their base. Capsule of five cells, with five valves, and five deciduous partitions. Seeds several, oblong, hairy.

Obl. Specimens in seed, from professor Desfontaines, have enabled us to reconcile his account, and that of Linnaeus, with the observation of Forksall, that "the capsule has only one cell," the partitions being deciduous, and concealed among the hairy seeds. Not having examined the nectariferous scales, we have, in deviding to Labillardiére's and Hooker's plates of the second species, made the description so general as to accord with both.

1. R. vermiculata. Saltwort-leaved Reaumuria. Linn. Sp. Pl. 754. Willd. n. 1. Forsk. Egypt. Arab. 101. Desfont. Atlant. v. 1. 431. Lamarck Illus. t. 489. f. 1. (Sedum fiscum maritimum vermiculatum, flore Saxifragae albo, femine villoso; Bocc. Sic. 6. t. 4. f. C. G. S. minimum arborecens vermiculatum; Lob. 1c. 386. Kali vermiculatum albo et amplo sedis rofis flore; Barcel. 1c. t. 888. Vermiculata frutex minor; Ger. Em. 523; at least the figure, which is that of Lobel. The description accords rather with Salsola fruticosa, as cited by Hudson.)—Leaves linear-awl-shaped, convex beneath. Calyx entire.—Native of barren sandy ground towards the sea, in Sicily, Barbary, Egypt, and Syria, flowering in summer. The habit of the plant is like a Tamarius, or Salsola. Stem shrubby, bushy, much branched, round, smooth, whitish, leafy. Leaves numerous, scattered, soft, from a quarter to three quarters of an inch long, spreading, linear-awl-shaped, acute, feathery, smooth, glaucous; convex beneath; flat above; dotted on both sides with minute depressions. Desfontaines compares the leaves to those of Sedum reflexum. Flowers terminal, solitary, white, not unlike those of Saxifraga Cotyledon, each encompassed with a number of imitated floral leaves, like those of the same order or branch, but longer. Calyx leaves ovate, with a narrow, entire, membranous edge; and awl-shaped leaf-like point. Petals terminating in three or four lobes, well represented by Barcelier. Gatufae brown, very smooth, and somewhat shining; its valves rigid, reflexed after the seeds are discharged, and permanent. Seeds clothed with long, tawny, shining hairs. Forksall says this plant is used at Alexandria as a cure for the itch, being applied bruised externally, and taken internally in the form of a decoction. It is an elegant little shrub, well worthy of a place in our gardens, or green-houses, to which it is as yet a stranger.

2. R. hypericoides. Elliptic-leaved Reaumuria. Wild. a. 2. Ait. n. 1. Lamarck f. 2. (R. linifolia; Salix Parad.}
Parad. t. 18. Hypericum alternifolium; Labillard. Syr. facs. 2. 17. t. 10. —Leaves elliptic-lanceolate, flat. Calyx minutely crenate.—Gathered in barren dry ground, near the defert of Syria, by M. Labillardiere, to whom we are obliged for a wild specimen. The plant is said to have been introduced into England, by the late Mr. John Bell, about 1800, and is marked by Mr. Aiton as a hardy perennial. Its true genus is well ascertained by Lamark, Poiret, and Salisbury. The stem is herbaceous, about a foot high, simple, or branched, smooth, pale or reddish. Leaves alternate, glaucous, from half an inch to an inch in length, elliptic-oblong, or somewhat lanceolate, varying greatly in breadth, dotted all over. Flowers terminal, solitary, pale rose-coloured, with ebiqule petals. Calyx-leaves broader than in the former, their membranous edges finely crenate, their points very small. We know nothing of the capsula or seeds.

REAY, in Geography, a town of Scotland, in the county of Caithness; 6 miles W. of Thurso.

REBACH, a river of France, which runs into the Rhine, nearly opposite to Manheim.

REBAIS, a town of France, in the department of the Seine and Marne, and chief place of a canton, in the district of Coulommiers; six miles N.E. of it. The place contains 1376, and the canton 11,284 inhabitants, on a territory of 196 kilometres, in 18 communes.

RE-BAPTISANTS, a religious sect, who maintain, that persons irregularly baptiz'd are to be baptiz'd afresh.

The Anabaptists are re-baptiz'd, inasmuch as they baptiz'd those at maturity, who had been before baptiz'd in childhood.

St. Cyprian and pope Stephen had mighty differences about the re-baptiz'd of converted heretics.

Donatus was condemned at Rome in a council, for having re-baptiz'd some persons, who had fallen into idolatry after their first baptism.

REBAT, in Geography. See Rabat.

REBATE, in Architecture. See Joinery and Plane.

Rebate, or Rabat, Rebatement, in Commerce, a term much used at Amsterdam for a discount or abatement in the price of certain commodities, when the buyer advances the sum in hand, for which he might have taken time. See Discount.

Rebate (among us usually called prompt payment) is estimated by months, and is only allowed for certain kinds of merchandize, which, according to the custom of Amsterdam, are

15 months, or 10 per cent. on German, Prussian, and Polish wools.

18 months, or 12 per cent. on brown Muscovado sugar, pot-athes, soda, Italian Armoines, fatin, damalk, and flax fluffs.

21 months, or 14 per cent. on Spanish wool and lamb's wool.

23 months, or 22 per cent. on Italian silk and raw silk from the Levant, which silks are sold by the Antwerp weight, about 5 per 100 lighter than that of Amsterdam.

Dutch cloths, camlets, &c. are sold with 4 per cent. rabat, for ready money, or without any rabat at 9 months' credit.

Dutch flax fluffs are sold with 2 per cent. rabat at 6 months' credit: with 4 per cent. at 3 months; or with 6 per cent. for ready money.

In all sales of goods, except those last mentioned, a further abatement is made of 1 or 2 per cent. for prompt payment.

At Hamburgh, some sorts of merchandize, when sold in large quantities, have an allowance made of 7, 13, or 19 months rabat, reckoned at 8 per cent. per annum; which the buyer, when he pays ready money, or pays within four weeks of the day of sale, deducts from the nominal price.

Refined sugars, Englifh and Dutch cloths, Englifh baize, hallabons, flammes, kerfeymeres, ratteens, and ferges, are sold with 7 months' rabat, or 41 per cent.; that is, 41 are deducted from 1045, or 7 from 157.

Cotton, cinnamon, cochineal, indigo, ginger, nutmegs, cloves, mace, rice, raw sugars, capers, currants, cumine, gall-nuts, Ruffian leather, linen, crape, Italian silks, table-linen, Silefia cloth, Marfellis foap, almonds, furnac, mollofies, Turkish yarn, Italian tartar, are sold with 13 months' rabat, or 8 per cent. per annum; or 8 are deducted from 1032.

Silks from the Levant, as Ardaffette, Barutine, and Cerbbalf, are sold with 16 months' rabat, or 102 per cent.; that is, 8 is deducted from 87.

Kelly's Un. Camb. vol. i.

This interell called rebates, or rabat, is usually regulated on the footing of 8 per cent. per annum.

The reason of this expedient is, that the merchants having not always wherewithal to pay for their goods in hand, by means of the rebate, such as have, will find their acon in it; and such as have not will be engaged to discharge themselves as soon as possible, for the sake of the discount.

Rebatement, in Heraldry, a diminution or abatement of the dignity of the figures or bearing in a coat of arms. See Abatement.

REBECC, in Commerce, a measure of corn in Egypt, particularly at Alexandria, equal to about 4¼ bushels; as kiflos, another measure, is equal to 4 bushels, English measure: 17.94 rebbes are equal to 10 English quarters, and each of them contains 9587 cubic inches; and 16.51 kiflos are equal to 10 English quarters, and each contains 10418 cubic inches.

Rebec, a musical instrument resembling a fiddle, with a neck, finger-board, three lines tuned 5ths, and played with a bow.

Etymologists have tortured themselves to find a derivation for the name of a vulgar instrument, no longer in use. Some trace it from the Arabic, some from the Celtic, the Welsh, the Spanish, Italian, and old French. Indeed, so numerous, discorant, and unsatisfactory are their opinions, as neither to be worth writing, nor perusal, if we could give them a place.

Rebec and ribble feem to be the fame instrument, and are often indiscriminately used by Gower, Chaucer, and the still more ancient bards of Normandy, and our own country.

As the head, or scroll-work, of old viol and violins used to be curiously carved, so seems to have been that of the rebec. Chaucer compares the face of an old woman, an old trott, to the head of a rebec. Rabelais does the fame.

"A tel mineftrier tel rebec
Tenant toujours le verre au bec
Car elle avoit vilage de rebec."

REBECCHI, in Geography, a town of Italy, in the department of the Padua; 29 miles S.W. of Modena.

REBEL, Jean-Ferrv, ten. in Biography, one of the 24 violins of the king of France's band, and chamber compos-er to his majesty. He beat time for many years at the opera, and, in his day, praised for a great composer. His music for dances is still heard with pleasure. His capriccios, freaks, and dancing characters, have enjoyed great reputation. In 1703 he fet the opera of Ulysses, written by Guichard.
Rebel left two children: Francis, who died in 1775, and Anne, the wife of the celebrated Lalande, master of the king's band.

Rebel, François, knight of St. Michael, master, like his father, of the king's band, and director of the opera, born 1702, and died in 1775. He was the son of Jean-Ferry Rebel, director of the orchestra at the opera, and one of the twenty-four violins of the king's band. His son had obtained the revervation, in 1717, of chamber musician to the king, and in 1703, that of composer; having given proofs of his abilities by many different works, but, above all, by his "Pyramus and Thisbe," composed in partnership with Franoeur.

He was successively appointed to all the musical posts of honour and profit under the royal patronage and that of the public. The close and uninterrupted friendship between this musician and Franoeur, does honour to the memory of both; having composed jointly, for 50 years, successful pieces, without discovering to which of them the greater honour was due. Labordé. See Franoeur.

REBELLION originally signified a second resistance or rising of such as had been formerly overcome in battle by the Romans, and had yielded themselves to their subjection.

It is now generally used for a traitorous taking up of arms against the king, either by his own natural subjects, or by thefe formerly subdued; whether their view be to deprive him of the supreme authority, or whether they intend to retrench his commands in some particular affairs, in order to impose conditions on him. Popular commotion is a concourse of people, tumultuously assembled, and refting the voice of their superiors, whether their designs be against those superiors themselves, or only some private persons. Such violent commotions are common when the people think themselves aggrieved, and are occasioned by no order of men fo frequently as the tax-gatherers. (See the next article.) If the rage of the malcontents be particularly levelled at the magistrates, or others vested with the public authority, and they proceed to a formal disobedience or violent proceedings, it is called a "sedition." When the evil spreads, infecting great numbers in the city or provinces, and furnish in such a manner, that the sovereign is no longer obeyed, such a disorder custom has more especially distinguished by the name of "insurrection." All these disorders disturb the public order, and are crimes of state, even when arising from just caufes of complaint. For violent measures are interdicted in civil society; the injured party should have recourse to the magistrates, to whom they may apply for redress; and if justice be not obtained from them, their complaints may then be laid at the foot of the throne. Every citizen should even patiently suffer supportable evils, rather than disturb the public peace. Nothing less than a denial of justice from the sovereign, or affected delays, can excite the furious commotions of a provoked people; they in some measure justify themselves, if the evils be intolerable, and the oppressors great and manifest. But, it may be asked, what conduct shall the sovereign observe towards the insurgents? The reply in general is, that which shall at the same time be most consonant to justice, and most salutary to the state. If he is to reproach those who unnecessarily disturb the public peace; he is, by the same reason, to shew clemency towards unfortunate persons, to whom just cause of complaint has been given, and who are guilty only in having undertaken to do themselves justice; so that they have been wanting in patience rather than fidelity. The sovereign should consider that his rights are derived from those of civil society, from the truth reposed in him, from the obligation devolved upon him of watching over the welfare of the nation, of procuring its greatest happiness, and of maintaining in it order, justice, and peace. He will also duly distinguish the nature and degree of the different disorders which may disturb the state, oblige him to take arms, or substitute the means of force instead of those of authority. By confidcrations of this kind he will regulate his behaviour towards revolted subjects. It cannot be questioned, that subjects rising against their prince without cause deserve severer punishments; yet in this case the number of delinquents calls for the sovereign's clemency; shall he deplete a city, or defolate a province, in punishing their rebellion? Such a chaitlen, however just in itself, becomes a cruelty when extended to so great a number of persons. Had the insurrection of the Netherlands against Spain been totally unwarantable, every man of virtue would still execrate the memory of the duke of Alva, who made it his boast that he had cauused above 20,000 heads to be struck off by the hands of the common executioner. Let not his flagitious imitators (says the excellent Vattel) expect to justify their enormities by necessitj. Who was ever more unaccountably insulted by his subjects than Henry the Great of France? His conquests were ever accompanied by an uniform clemency, and at length that excellent prince obtained the succor he desired; he thereby gained over loyal subjects; whereas the duke of Alva lost his master the United Provinces. Tyrants alone will treat, as feditious, those brave and resolute citizens, who exhort the people to preserve themselves from oppression in the vindication of their rights and privileges; a good prince will commend such virtuous patriots, provided their zeal be tempered with moderation and prudence. If he has justice and his duty at heart; if he aspires to that immortal and unfailing glory of being the father of his people; let him influence the faltifh suggestions of a minister, who represents to him as rebels all those citizens who do not hold out their hands to chains, who refuse tamely to suffer the strokes of arbitrary power.

The safest, and the most just way thoroughly to appease sedition, is to give the people satisfaction; and if the insurrection has been without cause, which perhaps has never been the case, fill an amnesty is to be granted where the offenders are numerous. When this amnesty is once published and accepted, whatever has past must be buried in oblivion. A prince who makes any confidence of his word, is faithfully to keep what he has promised to rebels themselves; i.e. to those subjects who have revolted without reason or necessity. If his promises are not inviolable, what security have the rebels in treating with him? When they have once drawn the sword, they have nothing to do but, as one of the ancients expresses it, to throw away the scabbard. The prince will then want the mild and salutary means of appeasing a revolt; to exterminate the rebels will be the only expedient remaining. These will become formidable through despair; compassion will bellow succours on them; their party will increasell, and the state will be in danger. Vattel's Law of Nations, b. iii. See Civil War.

Rebel is sometimes also used, in our ancient statutes, for a person who willfully breaks a law; and sometimes for a villain disobeying his lord.

REBELLION, Commission of. See Commission.

REBELLIOUS Assembly, a gathering of twelve persons, or more, intending, going about, or practising, unlawfully, and of their own authority, to change any laws of the realm, or to destroy the indolence of any park or ground inclosed, banks of fish-ponds, pools, conduits, &c. to the intent the same shall remain void, or that they shall have way in any of the said grounds; or to destroy the deer in any park, fish in ponds, conyes in any warren, dovecotes,
Rebut is also used by the chemical writers, sometimes to signify four milks, and sometimes for what they call the ultimate matter of which all bodies are composed.

REBUTTER, from re, and the French bouter, to repel, or bar, in Law, the answer of the defendant in a cause to the plaintiff's sur-rejoinder.

The plaintiff's answer to the defendant's rebuttal, is called a sur-rebuttal.

REBUTTER is also when a man warrants any land or hereditament to another, and the perfon making the warranty, or his heir, sues him to whom the warranty is made, or his heir or assignee, for the same thing: if he, who is so sued, pleads the deed or fine with warranty, and prays judgment, if the plaintiff shall be received to demand the thing which he ought to warrant to the party, against the warranty in the deed, &c. this is called a rebuttal.

Again, if I grant to the tenant to hold fines impetitions vagi, and afterwards impede him for waste, he may debar me of the action, by shewing my grant; which is likewise a rebuttal.

REC, in Geography, a river of France, which runs into the Sarre, at Sarre Alb.

RECANATI, a town of the marquisate of Ancona; near which towards Macerata are seen the ruins of Helvira Ricina; a town built by the emperor Sept. Severus, and destroyed by the Goths; 8 miles N.E. of Macerata. N. lat. 43° 25'. E. long. 13° 39'.

RECIPIBAL, in Rural Economy, a term provincially used to signify filed or discoloured in stripes.

RECAPITULATION. See PALINODY, or RETRACTATION.

Recapitulation is a summary of the preceding discourse; or a concise, transient enumeration of the principal things insinuated on at large in it; by which the memory of the hearer is refreshed, and the force of the whole collected into one view.

An instance of this may be given in the peroration of Cicero's Manilian: "Quare, cum bellum ita necessarium fuit, ut negligi non posset: its magnum, ut accurate limine fit admissiitandum; & cum ei imperatorem praecipere politiss. in quo sit eximia bellis scientia, singularis virtus, clarifica auctoritas, egregia fortuna; dubitatis, Qurites, quin, &c."

In order to constitute a good repetition or recapitulation, it must be short and concise: it is also convenient to recite things in the same order in which they were at first laid down; but sometimes a repetition is made, by running a comparison between the speaker's own argument, and those of the adverse party, and placing them in opposition to each other; and this method Cicero takes in the conclusion of his third oration upon the Agrarian law. In some cafes, when the discourse is very long, and the arguments insinuated on have been many, the orator only mentions such things which he thinks of least consequence, by saying that he omits or passes over them, till he comes to what is of greater moment, which he represents more fully. Ward's Orat. vol. i. sect. 18. See PRETERITION.

RECAPTION, Recapitio, or Retractio, in Law, is a remedy given to the party himself for an injury to his personal property. This happens, when any one hath deprived another of his property in goods or chattels personal, or wrongfully detains one's wife, child, or servant; in which case the owner of the goods, and the husband, parent, or master, may lawfully claim and retake them, wherever he happens to find them, so be it not in a riotous manner, or...
or attended with a breach of the peace. Thus, e. g., if my horse is taken away, and I find him in a common, a fair, or a public inn, I may lawfully seize him to my own use; but I cannot justify breaking open a private stable, or entering on the grounds of a third person to take him, except he be feloniously stolen, but must have recourse to action at law. Recapture is unlawful, if it be done with intention to smother or compound a larceny. See Restitution of Stolen Goods.

Recaptur is also the taking a second dills of a formerly dills for the same cause, and also during the plea grounded on the former dills. Recapture is also the name of a writ lying for the party thus dills to recover damages. See REPLEVIN.

RECAPTURE, in Naval Injurious, denotes the recovery of a ship, or its cargo wholly or in part, after having been taken by an enemy. For every los occasioned by capture, whether lawful, i.e. when made by a declared enemy, according to the laws of war, or unlawful, i.e. when it is against the rules established by the law of nations, whether by friends or enemies, the insurer is liable, agreeably to the comprehensive and express words of the policy: and in every case of capture the insurer is answerable, to the extent of the sum insured, for the los actually sustained. This may be either total, as where the ship and goods insured are not recovered; or partial, as where the ship is recaptured or restored before abandonment; in which case the insurer is bound to pay the salvage, and any other necessary expenses the insured may have incurred by the recovery of his property. The insurer is liable for a los by capture, whether the property in the thing insured be changed by the capture or not.

As to the length of possession by an enemy, which is deemed sufficient to divest the property out of the original owner, or the effect of a recapture in revesting it; these are matters which can never now come directly in question between the insurer and insured, in any case of insurance upon real interest. In gaming injurious, or injurious without interest, indeed, when there was a recapture, the claim, as for a total los, seems formerly to have involved the question, whether the property in the thing insured had, by the capture, or any proceeding founded on it, been divested out of the original owner, or not, before the recapture. Nevertheless, when a ship is insured "intereet or no intereet," it has been repeatedly determined, that if the ship be taken, it is a total los, however illegal the capture may be, and though the ship may be retaken and restored to the owner. But though no question can now arise between the insured and the insurer, as to the effect of a capture or recapture, in divesting or revesting the property; it may not be deemed unimportant to inquire when a capture shall be deemed to transfer the property to an enemy, and what shall be the effect of a recapture in revesting it in the original owner. The general opinion seems to be that by the law of nations, the property of things captured in war is changed when all reasonable hope of recovering them is gone; and, with respect to things moveable, all reasonable hope of recovering them is presumed to be gone when they are brought within the protection of the enemy's forts. Grotius says, that ships or goods, taken at sea, become the property of the captors, when they are brought into the enemy's harbours, or to the place where his whole fleet is stationere: for then all hopes of recovering them may be said to vanish. But, he adds, that by the law of nations, as introduced among European states in more modern times, things are considered as captured, when they have been 24 hours in the power of the enemy. Others deny this rule of the law of nations, and infitl on the rule of the Roman law, that the prize must be carried "infra praefidium" before it can become the property of the captors; and by "praefidium" Grynberg underlands the camps, the ports, the towns, and the fleets, of the enemy. In our courts of admiralty, however, it has always been held, by the marine law of England, independent of the statute which commands restitution, and fixes the rate of salvare, the property is not changed in favour of a vendee or recaptor, fo as to bar the original owner, till there has been some regular letter of condemnation: and in the reign of King Charles II, a solemn judgment was given upon this point; and restitution of a ship taken by a privateer was decreed, after it had been fourteen weeks in the enemy's possession, because he had not been condemned. The same doctrine has, in several instances, prevailed in our courts of common law. In one case, it was held that nine days' possession by the captor, and in another, that four years' possession, and several voyages performed, will not change the property, without a sentence of condemnation.

In general, whenever a ship is taken by the enemy, the injured may abandon, and demand as for a total los; and he is not bound to make any claim or appeal in the enemy's courts of admiralty, or to litigate there the validity of the capture.

But the injured is in no case bound to abandon; and, as the law now stands, no capture by the enemy can be so total a los as to leave no possibility of recovery, for the jus poli- minimii continues for ever, except in the case of a captured ship converted into a ship of war. (Stat. 33 G. III. c. 66. § 42.) If the owner himself should retake his ship or goods, he will be fully intitled to them; and if they be retaken at any time, whether before or after condemnation, he will be intitled to restitution, upon payment of a settled salvare. Stat. 29 G. II. c. 34. § 24; and 33 G. III. c. 66. § 42.

The chance of the owner's recovering his property, does not, however, fulfill the demand of the injured, as for a total los: but in the case of a recapture, justice is done to the injured by putting him in the place of the injured. In questions upon policies of insurance, the nature of the contract as an indemnity, and nothing else, is always liberally considered.

When there has been a capture, whether legal or not, and the ship has been recaptured or restored, the insurer is bound to defray all necessary expenses which the injured has been put to for the recovery of his property. He is therefore liable for a sum of money paid by the injured to the captors, as a compromis made bonâ fide, to prevent the ship being condemned as prize. See RANSOM.

It often happens that a recaptured ship is in a state to prosecute her original voyage; and, in that case, it is the interest of the recaptors, as well as of the other parties concerned, that she should be permitted to do so. The last prize act (Stat. 33 Geo. III. c. 66. § 44.) has therefore very properly provided, "That if a ship be retaken before she has been carried into an enemy's port, it shall be lawful for her, if the recaptors consent thereto, to prosecute her voyage; and it shall not be necessary for the recaptors to proceed to adjudication till six months after the recapture, or till the return of the ship to the port from whence she failed; and the master, owners, or agents, with the consent of the recaptor, may dispose of their cargoes before adjudication; and in case the vessel shall not return to the port from whence she failed, or the recaptors shall have had no opportunity of proceeding regularly to adjudication within the six months, on account of the absence of the said vessel, the court of admiralty shall, at the instance of the recaptors, decree restitution to the former owners, they paying salvare, upon such evidence as to the court shall, under all the cir-

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RECAPTURE.

circumstances of the cafe, appear reasonable; the expense of
such proceeding not to exceed fourteenth pounds."

We shall here observe, that there is an obvious difference
between capture and arrest of princes; the object of the one
is prize, that of the other detention, with a design to restore
the ship or goods detained, or to pay the value to the owner.

When a ship is detained in a port after a declaration of war,
or the issuing of letters of reprisal, this more resembles a
capture than a detention, and gives the injured an immediate
right to abandon, as for a loss by capture, even though no
condemnation be pronounced, and though the ship be after-
twards recovered. The most frequent cause of detention is
an embargo, which is a proclamation or order of state, usu-
ally issued in time of war or threatened hostilities, prohib-
iting the departure of ships or goods from some or all of the
ports of such state until further order. An embargo
laid on ships and merchandise in the ports of this kingdom
by virtue of the king's proclamation, is illicitly legal, when
the proclamation does not contravene the ancient laws, or
tend to establish new ones; but only to enforce the execution
of such laws as are already in being, in such manner as the
king shall judge necessary. But whether an embargo be
legally or illegally laid, the injury to the owner, by the de-
tention of his ship or goods, is the same; and the insurer is
equally liable for the loss occasioned by it. If a ship be
seized after a cessation of arms and preliminary articles of
peace are signed, this shall not be deemed a capture, but only
an arrest of princes. For the regulation of salvage upon a
recapture, we refer to the article SAVAGE.

Capture by an enemy or a pirate, or an arrest of princes,
or even an embargo, is prima facie a total loss; and imme-
diately upon the capture, or upon a mere arrest, or at any
time while the ship continues under detention, the injured
may elect to abandon, and give notice to the insurer of his
intention so to do; and thus entitle himself to claim as for
a total loss from the insurer. For, from the moment of the
capture, the owners lose their power over the ship and cargo,
and are deprived of the free disposal of them; and, in the
opinion of the merchant, his right of disposal being su-
pended or rendered uncertain, is equivalent to a total de-
privation. It would therefore be unreasonable to oblige
the insured to wait the event of capture, detention, or
embargo.

There is this difference between a policy upon interest, and
a wager policy, that in the one case the injured may, if he
thinks proper, abandon the moment he has notice of a cap-
ture or detention, and this will bind the underwriters, what-
ever may be the ultimate fate of the ship; but in the case of
a wager policy there can be no abandonmemt, because the
insured has nothing to abandon.

But a capture or arrest does not necessarily, and at all
events, terminate in a total loss, so as to entitle the injured to
abandon; for as he cannot abandon till he has received ad-
dvice of the loss; if, at the time he receives such advice, or
before he has elected to abandon, he receive advice that the
ship or goods injured are recovered, or are in safety; he can-
not then abandon; because he can only abandon while it is a
total loss, and he knows it to be so; nor after he knows of the
recapture. Therefore, if a captured ship be retaken and
permitted to proceed on her voyage, so that the sufferers but
a small temporary inconvenience; this would only be a par-
tial, and not a total, loss.

On the other hand, a title to restitution upon a recapture
does not necessarily, and at all events, deprive the injured of
the right to abandon; for if, in conformance of the cap-
ture, the voyage be lost, or not worth pursuing; if the
salvage be very high; if farther expense be necessary, and
the insurer will not undertake at all events to pay it, he may
abandon. The rule is, that, if the thing injured be recovered
before any loss is paid, the insured is entitled to claim as for
a total, or a partial loss, according to the final event; that
is, according to the state of the case at the time he makes
his claim. There is no vested right to a total loss, till the in-
jured, having a right to abandon, elects to do so; for he is
only entitled to an indemnity for his loss as it stands at the
time of the action brought, or offer to abandon.

But if, after a total loss has been actually paid, the
thing injured be recovered, the insurer cannot oblige the
insured to refund the money he has received; but he
shall stand in the place of the injured, and so no injustice is
done.

Cafes are mentioned by Mr. Serjeant Marshall, which serve
as examples to shew that though a captured ship be recap-
tured, yet if the voyage be lost, the loss will be total, and
the insured will have a right to abandon.

By the marine law, the property was not changed by the
capture, till after condemnation; and since the 29 Geo. II.
c. 34, the "jus po!fllimiini" continues for ever. A recapture
does not in all cases prevent the loss being total. If the
voyage be absolutely lost, or be not worth pursuing; if the
salvage be very high; if further expense be necessary; if the
insurer will not engage, at all events, to bear that expense,
though it should exceed the value, or fail of success: under
these, and many other familiar circumstances, the injured may
difentangle himself and abandon, notwithstanding there was
a recapture. Upon a recapture the property returns to the
original owner, pledged to the recaptors for the amount of
the salvage: upon the payment of which he is intitled to
restitution. If upon a recapture the captain, finding that
the voyage cannot be pursued, and, acting fairly for the
benefit of all concerned, sells the ship and cargo to pay the
salvage, and thereby put an end to the voyage, the in-
jured may abandon and recover as for a total loss. How-
ever, a capture does not necessarily amount to a total loss, nor
does a recapture prevent its being total. If the captain
purchase the ship from the captors for account of his
owners, the money paid, being in the nature of salvage, is
only partial loss.

To this article we shall subjoin two or three remarks
upon the subject of abandonment, which do not elsewhere
occur. A time should be fixed when the degree of the in-
urer's responsibility should be ascertained. In several me-
ritime states on the continent, positive regulations have
been established, limiting the time, after a loss has happened,
within which the injured may abandon. In England we have
no such positive regulation, nor any time limited by law for
abandoning. But the courts have laid down a rule, better
adapted to the purpose; and the rule is, that as soon as the
insured receives advice of a total loss, he must make his
election whether he will abandon or not. If he determines
to abandon, he must give the underwriters notice of this
within a reasonable time after the intelligence arrives; and
any unnecessary delay in giving this notice will amount to a
waver of his right to abandon; for unless the owner does
some act, signifying his intention to abandon, it will be
only a partial loss, whatever may be the nature of the loss,
or the extent of the damage. If the insurers in any manner
prevent the abandonment, they shall pay the whole loss, to
the amount of the sum injured. If no intelligence be re-
ceived of a ship within a reasonable time, it shall be pre-
sumed that she foundered at sea: when the time has elapsed
which affords that presumption, the injured may abandon,
and claim as for a total loss. Marshall on Insurance,
vol. ii.
RECARDAINS, in Geography, a town of Portugal, in the province of Beira; 6 miles E. of Bragança Nova.

RECCAN. See Arracan.

RECCO, a town of the Ligurian republic, near the seacoast; 11 miles S.E. of Genoa.

RECEIT, a fort and harbour on the coast of Brazil. S. lat. 8° 10'.

RECEIT, or RECEIT, in Commerce, an acquittance or discharge; or a written acknowledgment of having received a sum of money.

Where the receipt is on the back of a bill, &c., it is usually called an endorsement.

Among trademen the receipt usually makes the second of the three articles of an account; the former contains the monies received; the two others the expense, and the return or balance.

By the 44 Geo. III. c. 98, the former flamp duties were repealed, and others imposed; by the 48 Geo. III. c. 149, these last were repealed, and the following were imposed; viz.

receipt or discharge given for or upon the payment of money

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<td>ditto 15l.</td>
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<td>ditto 50l. or upwards</td>
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And where any sum of money whatever shall be therein expressed, or acknowledged to be receiv'd, 5.

And any note, memorandum, or writing whatsoever, given to any person for or upon the payment of money whereby any sum of money, debt, or demand, or any part of any debt or demand therein specified, and amounting to 2l. or upwards, shall be expressed or acknowledged to have been paid, settled, balanced, or otherwise discharged or satisfied, or which shall import or signify any such acknowledgment, and whether the same shall or shall not be signed with the name of any person, shall be deemed and taken to be a receipt for a sum of money of equal amount with the sum, debt, or demand so expressed or acknowledged to have been paid, settled, balanced, or otherwise discharged, or satisfied, within the intent and meaning of this schedule, and of the foregoing act, and shall be charged with a duty accordingly.

And any receipt or discharge, note, memorandum, or writing whatever, given to any person for or upon the payment of money, which shall contain, import, or signify any general acknowledgment of any debt, account, claim, or demand, debts, accounts, claims, or demands, whereby the amount shall not be therein specified, having been paid, settled, balanced, or otherwise discharged or satisfied, or whereby any sum of money therein mentioned shall be acknowledged to be received in full, or in discharge or satisfaction of such debt, account, claim, or demand, debts, accounts, claims, or demands, and whether the same shall or shall not be signed with the name of any person, shall be deemed and taken to be a receipt for the sum of 50l. or upwards, within the intent and meaning of this schedule, and of the foregoing act, and shall be charged with the duty of 5e. accordingly.

By 43 Geo. III. c. 126, such receipt shall not be available in law or equity as such acknowledgment, or be given in evidence, unless duly stamped as aforesaid.

And all receipts, discharges, and acknowledgments of the description aforesaid, which shall be given for or upon payments made by or with any bills of exchange, drafts, promissory notes, or other securities for money, shall be deemed and taken to be receipts given upon the payment of money within the intent and meaning of this schedule and of the foregoing act.

Exemptions from the preceding Duties on Receipts.

Receipts exempted from stamp duty by any act or acts of the present parliament, relating to the aforesaid taxes.

Receipts or discharges given by the treasurer of the navy for any money imprested to or received by him for the service of the navy.

Receipts or discharges given by any agent for money imprested to him on account of the pay of the army or ordnance.

Receipts or discharges given by any officer, seaman, marine or felder, or their representatives respectively, for or on account of any wages, pay, or pension due from the navy-office, army pay-office, or ordnance-office.

Receipts or discharges given for the consideration money, for the purchase of any share in any of the government or parliamentary fleets or funds, or in the fleets and funds of the government and company of the bank of England, or of the East India company, or South Sea company, and for any dividend paid on any share of the said fleets or funds respectively.

Receipts given for money deposited in the bank of England, or in the bank of Scotland, or royal bank of Scotland, or in the bank of the British linen company in Scotland, or in the hands of any banker or bankers, to be accounted for on demand, provided the same be not expressed to be received of or by the hands of any other than the person or persons to whom the same is to be accounted for; but if with interest, see Promissory Notes.

Receipts or discharges written upon promissory notes, bills of exchange, drafts or orders for the payment of money duly stamped according to the laws in force at the date thereof, or upon bills of exchange drawn out of, but payable in Great Britain.

Receipts or discharges given upon bills or notes of the governor and company of the bank of England; letters by the general post acknowledging the safe arrival of any bills of exchange, promissory notes, or other securities for money.

Receipts or discharges indorsed or otherwise written upon, or contained in any bond, mortgage, or other security, in any conveyance, deed, or instrument whatever, duly stamped according to the laws in force at the date thereof, acknowledging the receipt of the consideration money therein expressed, or the receipt of any principal money, intereß, or annuity thereby secured.

Release of discharges for money by deeds duly stamped according to the laws in force at the date thereof.

Receipts or discharges given for drawbacks or bounties upon the exportation of any goods or merchandise from Great Britain.

Receipts or discharges for the return of any duties of customs upon certificates of over entry.

Receipts or acknowledgments of payments indorsed upon any bills, orders, remittance bills, or remittance certificates, drawn by commissioned officers, masters, and surgeons in the navy, or by any commissioner or commissioners of the navy, under the authority of the act passed in the 35th year of his majesty's reign, for the more expeditious payment of the wages and pay of certain officers belonging to the navy.

3 T 2

Receipts
Receipts or acknowledgments of payments indorsed upon any bills drawn pursuant to any former act or acts of parliament, by the commissioners of the navy, or by the commissioners for managing the transport service, and taking care of sick and wounded seamen, upon and payable to the treasurer of the navy.

If any person shall write or sign any receipt liable to any stamp duty, without being first duly stamped as aforesaid; or with a stamp of a lower value than is herein directed; he shall forfeit 10l. if the sum paid or expressed therein shall not amount to 10l.; and 20l. if the sum amount to 10l. or upwards. 31 Geo. III. c. 27. s. 17. 35 Geo. III. c. 55. s. 8.

Every person who shall give any receipt or writing acknowledging the payment of money, in which a less sum shall be expressed than the sum actually paid or received, or who shall separate or divide the sum actually paid or received into divers sums, or shall write off any part of any debt, or demand, or be guilty of or concerned in any contrivance with intent to defraud his majesty, shall forfeit 50l. 35 Geo. III. c. 55. s. 9.

And the persons, or their agent, from whom any sum shall be due or payable, and who shall have paid such sum, may provide a stamp with the proper duty, or of some higher rate of duty than required, and demand of the person entitled to such sum, or any agent to whom the same shall have been paid, a receipt for such sum, and also the amount of the duty thereon as aforesaid; and if such person refuse to give such receipt upon demand thereof, or to pay the amount thereof, every such person shall forfeit for each offence 10l. 43 Geo. III. c. 126. s. 5.

Stamps denoting the duties under former acts may be used, provided they be applied to receipts of the like amount as required by this act. s. 8.

And all vellum, parchment, and paper liable to any stamp duty as aforesaid, shall be stamped before the same be written or printed upon; or may be brought to the said commissioners or their officers to be stamped within 14 days after such receipts shall be given or bear date, and shall be stamped on payment of 5l. over and above the duty; and if brought after 14 days within one calendar month, on payment of 10l. over and above the duty. 31 Geo. III. c. 25. s. 19. 20. 35 Geo. III. c. 55. s. 10. 11.

All penalties by this act incurred may be fixed for in the courts of Westminster; or any neighbouring justice may hear and determine any offence which subjects the offender to any pecuniary penalty; who may, on complaint made within three calendar months, summon the party accused, and the witnesses, and examine into the matter of fact; and on confession, or the oath of one witness, may give judgment therein, and levy such penalty by direct, on the goods of the offender, which, if not redeemed within six days, may be sold; and such penalty shall be divided half to the king, and half to the informer; and for want of sufficient direct, the offender shall be committed to prison for three calendar months, unless such penalty shall be sooner paid. 31 Geo. III. c. 25. s. 24. 25. 35 Geo. III. c. 55. s. 12. 13.

If any person shall find himself aggrieved by the judgment of such justice, he may, upon giving security to the amount of such penalty and costs, appeal to the next sessions, which shall happen 14 days next after such conviction, on giving reasonable notice; and in case such judgment be affirmed, they may award the person appealing such costs 2s. to them shall seem meet. Id.

Provided, nevertheless, that such justice may, where he shall see cause, mitigate any such penalty, so as not to reduce the same to less than one moiety thereof and above the costs. 31 Geo. III. c. 25. s. 26. 35 Geo. III. c. 55. s. 14.

Witnesses not appearing, having been duly summoned, without reasonable cause to be allowed by such justice, or refusing to give evidence, shall forfeit 40s. to be recovered in like manner. 31 Geo. III. c. 25. s. 27. 35 Geo. III. c. 55. s. 15.

Perfons counterfeiting or forging any stamp hereby directed to be made use of shall be guilty of felony without benefit of clergy. 31 Geo. III. c. 25. s. 29. 35 Geo. III. c. 55. s. 17. 43 Geo. III. c. 126. s. 11.

All powers given by any former act relating to the stamp duties shall extend to this act. 31 Geo. III. c. 25. s. 30. 35 Geo. III. c. 55. s. 18. 43 Geo. III. c. 126. s. 12.

Perfons sued or prosecuted on account of any thing done in pursuance of this act may plead the general issue and give the special matter in evidence; and if a verdict be for the defendant, or the plaintiff be non-suited, treble damages shall be awarded against such plaintiff. s. 15.

By the 44 Geo. III. c. 98, the former duties on legacies under the care of the commissioners for stamp duties were repealed, and new duties were imposed. By the 45 Geo. III. c. 28, additional duties were imposed, and by the 43 Geo. III. c. 149, the following were imposed (being by f. 3. of this last act placed under the provisions of former acts relating to such duties,) and those imposed by former acts were repealed.

Schedule, Part III. Legacies and successions to personal or moveable estate upon intestacy.

I. Where the testator, testatrix, or intestate, died before or upon the 5th of April 1805.

For every legacy, specific or pecuniary, or of any other description, of the amount or value of 20l. or upwards, given by any will or testamentary instrument of any person who died before or upon the 5th day of April 1805, out of his or her personal or moveable estate, and which shall be paid, delivered, retained, satisfied, or discharged, after the 10th of October 1808.

Also for the clear residue (when devolving to one person), and for every share of the clear residue (when devolving to two or more persons), of the personal or moveable estate of any person who died before or upon the 5th day of April 1805 (after deducting debts, funeral expenses, legacies, and other charges first payable thereout), whether the title to such residue, or any share thereof, shall accrue by virtue of any testamentary disposition, or upon a partial or total intestacy; where such residue, or share of such residue, shall be of the amount or value of 20l. or upwards, and where the same shall be paid, delivered, retained, satisfied, or discharged, after the 10th of October 1808.

Where any such legacy, or residue, or share of such residue, shall have been given, or devolved, to or for the benefit of a brother or sister of the decease, or any descendant of a brother or sister of the decease; a duty at and after the rate of 2l. 10s. per cent. on the amount of the value thereof.

Where to or for the benefit of a brother or sister of the father or mother of the deceased, or any descendant of a brother or sister of the father or mother of the deceased; a duty at and after the rate of 4l. per cent. on the amount or value thereof.
Where to or for the benefit of a brother or sister of a grandparent or grandmother of the deceased, or any descendant of a brother or sister of a grandparent or grandmother of the deceased; a duty at and after the rate of 5l. per cent. on the amount or value thereof. 

Where to or for the benefit of any person in any other degree of collateral consanguinity to the deceased, than as above described, or to or for the benefit of any stranger in blood to the deceased; a duty at and after the rate of 8l. per cent. on the amount or value thereof.

Where to or for the benefit of a brother or sister of a grandparent or grandmother of the deceased, or any descendant of a brother or sister of a grandparent or grandmother of the deceased; a duty at and after the rate of 5l. per cent. on the amount or value thereof. 

Where to or for the benefit of any person in any other degree of collateral consanguinity to the deceased, than as above described, or to or for the benefit of any stranger in blood to the deceased; a duty at and after the rate of 8l. per cent. on the amount or value thereof.

And all gifts of annuities, or by way of annuity, or of any other partial benefit, or intereft, out of any such estate or effects as aforesaid, shall be deemed legacies within the intent and meaning of this schedule.

11. Where the testator, testatrix, or intestate, shall have died after the 5th of April 1805.

For every legacy, specific or pecuniary, or of any other description, of the amount or value of 20l. or upwards, given by any will or testamentary instrument, of any person who shall have died after the 5th of April 1805; either out of his or her personal or moveable estate, or out of or charged upon his or her real or heritable estate, or out of any monies to arise by the sale, mortgage, or other disposition of his or her real or heritable estate, or any part thereof, and which shall be paid, delivered, retained, satisfied, or discharged after the 10th of October 1808.

Also, for the clear residue, (when devolving to one person), and for every share of the clear residue (when devolving to two or more persons), of the personal or moveable estate of any person who shall have died after the 5th of April 1805, (after deducting debts, funeral expenses, legacies, and other charges first payable thereout), whether the title to such residue, or any share thereof, shall accrue by virtue of any testamentary disposition thereof, or upon a partial or total intestacy, where such residue, or share of residue, shall be of the amount or value of 20l. or upwards, and where the same shall be paid, delivered, retained, satisfied, or discharged after the 10th of October 1808.

And also for the clear residue (when given to one person), and for every share of the clear residue (when given to two or more persons), of the monies to arise from the sale, mortgage, or other disposition of any real or hereitable estate, directed to be sold, mortgaged, or otherwise disposed of, by any will or testamentary instrument of any person who shall have died after the 5th of April 1805, (after deducting debts, funeral expenses, legacies, and other charges, first made payable thereout, if any), where such residue, or share of residue, shall amount to 20l. or upwards, and where the same shall be paid, delivered, retained, and discharged, after the 10th of October 1808.

Where any such legacy or residue, or any share of such legacy or residue, shall have been given, or have devolved, to or for the benefit of a child of the deceased, or any descendant of a child of the deceased; a duty at and after the rate of 1/4 per cent. on the amount or value thereof. 

Where to or for the benefit of a brother or sister of the deceased, or any descendant of a brother or sister of the deceased; a duty at and after the rate of 1/4 per cent. on the amount or value thereof.

Where to or for the benefit of a brother or sister of the father or mother of the deceased, or any descendant of a brother or sister of the father or mother of the deceased; a duty at and after the rate of 1/4 per cent. on the amount or value thereof.
appeal, the duty shall be paid according to such variation; and if the duty affixed in manner aforesaid shall exceed the duty offered to and refused by such flamp officers, the expenses shall be borne by the person liable to pay such duty. If any dispute shall arise between persons entitled to any such legacy, or residue, or taking administration as aforesaid, respecting the value thereof, or duty to be paid thereon, the duty shall be affixed by such flamp commissioners on reference to them by either party; and if the value of such property shall be in dispute, such flamp commissioners shall cause an appraisement to be made thereof, at the expense of the person liable to pay the duty, in manner aforesaid; and if such person shall be dissatisfied with such valuation, the same shall be reviewed and finally determined by the said commissioners of the land-tax, upon appeal to them within the time and in the manner aforesaid. And if the effects whereon such duty is payable shall be ten miles from London, such persons as shall be deputed by the said flamp commissioners shall act in their stead. f. 22. Geo. III, c, 52.

And if it shall appear to the said flamp commissioners, upon oath, to be administered by a justice, or master extraordinary in chancery, that such duty has been paid than ought to have been, by mistake, without intention of fraud, such mistake may be rectified by such commissioners, who may accept the duty really due within three calendar months, if no suit hath been instituted, and on payment of 10l. per cent. thereof by way of penalty. f. 30.

Every person paying or receiving money contrary to this act, who shall within twelve calendar months discover the other party offending, so as be convicted thereof, shall be indemnified and discharged from all penalties against this act. f. 31.

And all powers of forming acts relating to the flamp duties, not hereby altered, shall be in force, in the execution of this act. f. 42.

Wherever any executor or administrator shall not have paid the said duties within time, the court of exchequer may, on application from the flamp office on satisfactory affidavit, grant a rule for such executor to shew cause why he should not deliver to the commissioners an account on oath of all legacies, or of the personal property paid or payable by him, and why the duties thereon have not been, or should not be forthwith paid, and may make such rule absolute where it appears proper. And regisrars of ecclesiastical courts shall, within a month of requisition, deliver to the flamp office an account of wills and letters of administration in their custody, with particulars relating thereto, and extracts from any wills deemed necessary by the commissioners, on payment of fees agreed on or allowed by the ecclesiastical court, on pain of 50l. recoverable by information by the attorney-general. 42 Geo. III, c. 99. f. 2, 3.

And by the 5 W. c. 21, the probate of any will or letters of administration of any common folder or scaman, slain or dying in the service, shall be exempt from the flamp duties. f. 6.

RECEIPT, of Rescrt, in Law, See Rescrt.
RECEIPT of Homage. See rescr.
RECEIPT of the Exchequer. See COURT of Exchequer.
RECEIPT, in Medicine. See RECIPE.
RECEIPT, Auditor of. See AUDITOR.
RECEIVER, or RESCRIPT, in Chemistry. A globe-shaped vessel, which is adapted to the neck or beak of an alembic, retort, or other distillatory vessel, in order to collect, receive, and contain the products of distillations.

Receivers should be made of glass, not only because this matter refits the action of the strongest and most corrosive substances, but also because being transparent, it allows the operator to see through it, and to judge by the frequency of the drops, if the distillation be too quick or too slow, and also if the quantity and nature of the substances that come over be such as are required.

Almost all receivers are kinds of bottles of different sizes, of a spherical form, the necks of which are cut short, and each of which is pierced with a small hole in its lateral or upper part, to give vent to the air or vapours, which are too expansive. Receivers of this form are called balloons; which see. Some receivers are made of long necks. These are generally adapted to the beaks of glafs alembics. The long neck serves to keep the belly of the receiver, where the liquor is collected, at a proper distance from the fire.

Receivers have different forms for particular operations. Such are those which have two or three beaks, either to be adapted to other receivers, or to admit at the same time the necks of several distillatory vessels, when the intention of the operator is, that the vapours of different substances should meet in the same receiver. Such also are receivers for essential oils, obtained from aromatic plants distilled with water, which are so made, that they are never full, but that the water runs out, and leaves the oil behind. These are a kind of glafs cucurbits, which contract as they rise higher; so that their neck or upper opening is but nearly of a convenient size to receive the beak of the worm. These receivers have another opening about the middle of the swelling or belly; and to this opening is joined a glafs tube, which bends and rises vertically along the outer part of the receiver, so as to be within two inches and a half as high as the upper opening. At this height the tube bends again towards the side opposite to the body of the receiver, to pour into another vessel the liquor which arises there. It forms the figure of an S.

When this receiver is to be used, it is to be placed vertically under the beak of the worm. During the distillation, the liquor rises to an equal height in the body of the receiver, and in the crooked tube: when, therefore, the height of the liquor in the receiver becomes greater than the height of the tube, it must begin to flow from the mouth of this tube into another vessel placed on purpose to receive it; but as essential oils are either lighter or heavier than water, and as they are, therefore, always collected either above or under the water, and as the liquor which discharges itself through the tube is taken from the middle part of the receiver, nothing but water can be evacuated at the mouth of the pipe, while the oil always remains in the receiver. With such a receiver distillation may be performed without the trouble of changing the vessels. Macquer's Chem. Dict.

See DISTILLATION and LABORATORY.

RECEIVER of an Air-Pump, is part of its apparatus; being a glass vessel placed on the top of the plate, out of which the air is to be exhausted. To an air-pump belong various receivers, of various forms and sizes, and serving for various purposes. See AIR-PUMP.

RECEIVER, Exhausted, in Pneumatics. See EXHAUSTED. And for the method of repairing those that are cracked, see CEMENT.

RECEIVER, Receptor, or Receptacle, in Law, is used commonly in the bad sense, for such as knowingly receive stolen goods from thieves, and conceal them.

This offence is only a misdemeanor at common law: however, by the statutes 3 & 4 W. & M. c. 9. and 5 Ann. c. 31, the offender is made accessory to the theft and felony. But because the accessory cannot in general be tried, unless with the principal, or after the principal is convicted, the receivers
receivers by that means frequently eluded justice; to remedy which it is enacted by statute 1 Ann. c. 9. and 5 Ann. c. 31. that such receivers may be still prosecuted for a misdemeanor, and punished by fine and imprisonment, though the principal felon be not before taken, so as to be prosecuted and convicted. And in case of receiving stolen lead, iron, and certain other metals, such offence is, by statute 29 Geo. II. c. 30. punishable by transportation for fourteen years. So that now the protector has two methods in his choice: either to punish the receivers for the misdemeanor immediately, before the thief is taken (Folter. 373.); or to wait till the felon is convicted, and then punish them as accessory to the felony. But it is provided by the same statute, that he shall only make use of one, and not of both these methods of punishment.

By the same statute also (29 Geo. II. c. 30.) persons having lead, iron, or other metals in their custody, and not giving a satisfactory account how they came by the same, are guilty of a misdemeanor, and punishable by fine and imprisonment. And by statute 10 Geo. III. c. 48. all knowing receivers of stolen plate or jewels, taken by robbery on the highway, or when a burglarly accompanies the stealing, may be tried as well before as after the conviction of the principal, and whether he be in or out of custody; and, if convicted, shall be adjudged guilty of felony, and transported for fourteen years. By stat. 21 Geo. III. c. 68. the receiving of any stolen copper, brass, bell-metal, or utensil fixed to any building, or any iron rails or fencing set up in any court or other place, is made transportation for seven years, or three years imprisonment to be kept to hard labour. By stat. 21 Geo. III. c. 69. the receiving of stolen pewter of any kind is subjected to the like penalty, although the principal has not been convicted. By stat. 22 Geo. III. c. 58. the receiving of any stolen goods, (except lead, iron, copper, brass, bell-metal, and folder,) is made a misdemeanor, punishable by fine and imprisonment, or whipping, as the court shall appoint; which shall exempt the offender from being punished as accessory, although the principal be afterwards convicted, and the offence shall appear to be grand larceny, or some greater offence. (See Larceny.) For the punishment of receivers of goods stolen by bum-boats, &c. on the river Thames, see stat. 2 Geo. III. c. 28. § 12. Receivers of stolen goods stolen from the bleaching-grounds are, by stat. 18 Geo. II. c. 27. declared felons without benefit of clergy.

In France, receivers are punished with death; and the Gothic constitutions diluguihino also three sorts of thieves: “Unum qui confilium dare, alterum qui contraret, tertium qui receptaret et occula: part viae sanguis obnoxios.”

Receiver also denotes an officer, of which there are various kinds, denominated from the particular matters they receive, the places where, or the persons for whom, &c.

As receiver of rents; receiver-general of the customs; receiver of the fines, upon original writs in chancery, &c.

Receiver-General of the Duchy of Lancaster, is he who gathers all the revenues and fines of the lands of the said duchy, all forfeitures, nullities, &c.

Receiver-General of the public revenue is an officer appointed in every county, to receive the taxes granted by parliament, and remit the money to the treasury.

Receiver’s Office. See Greenwich Hospital.

RECENT FRUITS. See Fruit.

RECEPtACLE of Stall Manure, in Agriculture, the place where the various matters from the stalls, and other places where animals are kept, are deposited and laid up.

Some suppose that these places should be a little hollow or excavated; while others are of quite a different opinion, and think that they should be even, or a little raised. A very slight hollowing is, however, probably the best. An experienced writer on this subject suggests, that it is not to be inferred that, because they should be hollow, they should also be deep; as one principal use of them is to bring the rain waters, which fall within the yards or inclosed parts, into a flagrant slate, and to let them off superficially, so as to prevent any thing of the ground current kind from carrying away the dung, either in a bodily manner, or in a thick fluid slate: they may, in this way, suffer the more watery particles only to pass away into reservoirs, prepared to preserve and keep them for future use. It is believed that two feet on the lower side, or deeper parts, may be taken as a mean depth; but less may often be quite sufficient: and the bottoms of the waste-water channels being laid six or eight inches lower than the rim of the basons, the depth of water which they can contain is, it is concluded, not more than sixteen or eighteen inches, when empty of manure. But it is suggested, as necessary to good farm management, that, soon after the winter’s manure has been removed and cleared away, floorings of marble, or some other earthy fertilizing material, mixed with lime, to the thickness of ten or twelve inches, should be spread out over the bottoms of the basons or hollowed parts; by which means a rich compost for grass lands may be formed at small expense, on which all the offal materials of manure which can be collected, free from seeds of weeds, during the summer and autumn, should be deposited. In this manner the receptacles should be filled to the brims, even though no soluble manure were put into them during the above two seasons; so that the winter’s stall manures may have firm platforms to rest upon, out of the way of water, the great evil which antiquated prejudice so much fears in these manure receptacles, as the prevention of the due maturation of their different contents.

With these receptacles of manure there should be connected drains from the cattle-houses, stalls, and farm-offices, for receiving and conveying the urine, and other liquid matters, from them to these basons or receptacles; and the mouths of their outlet channels should be well guarded, in order to prevent their being choked up by the manure, when piled up to considerable height above them. The receptacles, pits, or wells, which are made before them, are always to be kept free, for the superfusions of water, or other liquid matters of the receptacles, to drain or filtrate into; and thence to pass away in moist weather; or to be pent up in them, in dry warm seasons, for the purpose of being thrown over the piled-up manures, for the promotion of their decay and maturation.

Where there are grass lands lying conveniently below these receptacles and reservoirs for receiving their overflows, all the different parts of the places, where they are situated, may be made to beleve gently towards them; but where land cannot be commanded for favouring this intention, the receptacles or basons should receive no other waters than what are supplied to them by the atmosphere. This regulation may easily be accomplished, simply by raising their rims a few inches higher than the surrounding surfaces, which should be frequently cleared from the manure and litter dropped upon them, deposing all such substances within their rims. The rain-water which falls in these cases, is to be conveyed to the catch-pools, or the most contiguous common drains. In all cases, that which falls upon the buildings should be conveyed away, without being suffered to pass through the receptacles or basons, unless
unles where liquid manure is more in demand than that of the bulky kind.

From the flow progresses made by manures of this sort to maturation, in the winter season, in the open air, even when piled up in the worst situations, on account of its being constant, moist, or faturated with moisture, and exposed to the effects of the cold atmosphere, the plan of giving receptacles of this sort a long oval square form, and covering them with roofs, to free them wholly from rain, as well as to defend them from cold, has been hit upon, and recommended from authority. As by thus affording the articles of manure the means of passing into the state of fermentation, in the winter months, their putrefaction and decay would be beneficially promoted, for the use of the more early crops of the spring. But how far the advantage, gained in this way, may equal or be superior to the expense of building, and extra labour in the removals of the manure, is a point which is by no means yet fully decided. And the superior benefits, which have lately been derived from the use of manure in its more raw or fresh state, render all such schemes perhaps of less importance than would otherwise be the case.

As it is a matter of great consequence to prevent the evil waste of this sort of manure, which at present frequently takes place in most parts of the country, it has been suggested by an experienced writer, who has attended much to the subject, and thought a great deal upon it, that piling it in shallow receptacles or basins, and conducting the liquor, when not wanted for moistening the piles of manure, which overflows from them, to reservoirs or catch-pools, in order to stop, deposit, and arrest the heavier and more gross particles that may be conveyed in it, and to provide a valuable collection of liquid manure in particular situations, and of rich muddy matters in others, are the most appropriate practical means of accomplishing the matter, in an easy and cheap way, that can be adopted or had recourse to. See Dung, Farm-Yard, Homestead, Manure, Reservoir, and Yard Manure.

RECEPTACULUM, Receptacle, in Botany and Vegetable Physiology, is the seventh, or last, part of fructification distinguished by Linnæus, being the common bases, or point of connection, of the others. (See Fructification.) It is evident that such a part must exist, under some shape or other; yet the receptacle is not always distinguished by any particular figure. In simple flowers it is often little more than a mere point; in compound ones it is very remarkable and important, serving, by its differences of structure, to afford very good generic distinctions. The receptacle of the Daily, Bellis, is conical; that of Chrysanthemum convex. In Spharanthus this part is very nearly globular, while in some species of Centarea and Carline it is either flat, or slightly concave. In Secus it is naked, destitute of hairs or scales between the florets or seeds; while in Cardus it is hairy, and in Anthemis variously scaly. This last genus differs, by the character in question alone, from Chrysanthemum, whose receptacle is naked; but the character is not quite so natural, in this case, as could be wished. Mr. Brown has observed to us, that it affords not even a certain artificial distinction, in the Chrysanthemum indicum of the gardens, Curt. Mag. t. 327; which Wilde-now, like M. de Ranuatre and professor Desfontaines, has referred to Anthemis, because they found the receptacle to be scaly. We are convinced they are in the right, and yet this appears to be the very same plant with Chrysanthemum indicum, the scales of the receptacle being variable, and sometimes almost, if not altogether, evanescence. Some genera of these clods have a cellular, or honeycomb-like receptacle, as Onapodium, and Tolpis (Crepis barbata of Linnæus). In that case the edges of the cells are variously jagged, toothed, or fringed, and they now and then are fearfully distinguishable from the reticulations or rugosities of some naked receptacles.

The receptacle of the flowers, in Linnæan language, means the area or space between the flauens and styles, in certain genera whose semen is inferior; as the whole umbelliferous order, in which the part in question is more or less tumid, often coloured, and assumes a glandular aspect. The receptacle of the seeds is not unfrequently a distinct part from the capsule or its valves, serving to connect the seeds therewith. (See an example of it in Redtea.) The rachiis, or common stalk of a spike, or spikelet, in Grapis, is also termed a receptacle.

In some plants the receptacle undergoes great changes, acquiring a different texture in the fruit, from what it had in the flower. Thus, the whole fruit, as we call it, of the Fig, (see Ficus,) is a common receptacle, at first coriaceous, and, like the rest of the plant, containing a milky, somewhat acid, juice. It forms a bag, lined with flowers or florets, and having a small aperture at the top. After the flowers are past, this bag becomes pulpy, coloured, and full of sweet aromatic juice. So the fruit of the Strawberry, (see Fragaria,) is but an originally small dry receptacle, subsequently enlarged, and become pulpy, whose outside is fluid with naked seeds. In Broadenetta, described under our article Papryus, the separate flake of each-germen becomes the enlarged and pulpy supporter of a naked feed. In Pollichia, (see that article,) the common receptacle of the flowers, minutely scaly, and hardly discernible, in its earlier state, changes to a congeries of white, juicy, sweet, tooth-like scales, elevating the seeds in their appropriate withered perianths, and altogether constituting one of the most extraordinary pulpy fruits that we have ever met with. A familiar change of substance is observable in the calyx of the Mulberry, as well as in Camellina Zanonia; a change common and natural in the germs of pulpy fruits, though rare in the particular parts of which we have been speaking.

RECEPTACULUM Gyni, in Anatomy, that portion of the trunk of the absorbing vessels, into which the lacteal absorbents pour the fluids which they have taken up in the alimentary canal; it is usually rather larger than the neighbouring portions of the vessel, and sometimes very considerably so. See Absorbents.

RECEPTARI, a term of reproach used for such physicians as wrote pompous receipts for loads of medicines, more confuting the good of the apothecary than the patient; as also for such as gave receipts for general medicines, to be used at the discretion of people wholly unacquainted with the nature of diseases.

RECEPTION, Receipt, in Philosophy, denotes the fame with passion, considered as opposed to action.

RECEPTION is also properly used for the manner of treating or entertaining a person; and the solemnities and ceremonies practised on that occasion. See Entry.

The reception of ambassadors is usually performed with a great deal of pomp.

RECEPTION is sometimes also used for the act of approving, accepting, and admitting a thing. See Acceptance.

The canon law only binds where it is received: the civil law is received in some countries, and not in others.

The French would never receive the council of Trent, the Spanish inquisition, nor the dogmata of the ultramontane canonists.

Reception,
The Rechabites, a kind of religious order among the ancient Jews, instituted by Jonadab the son of Rechab; and comprehending his family and posterity. Their founder preferred them three things: first, Not to drink any wine. Secondly, Not to build any houses, but to dwell under tents. Thirdly, Not to sow any corn, or plant any vines.

The Rechabites observed these rules with great strictness, as appears from Jerem. xxxv. 6, &c. Whence St. Jerom, in his thirteenth epistle to Paulinus, calls them "naebei, monks." Jonadab, their founder, lived under Jehoshaf, king of Judah, contemporary with Jethro, king of Israel; his father Rechab, from whom his posterity were denominated, descended from Raguel or Jethro, father-in-law to Moses, who was a Kenite, or of the race of Ken; whence Kenite and Rechabite are used as synonymous in scripture.

The Kenites entered the promised land with the Hebrews, and dwelt in the tribe of Judah, about the Dead sea. They were distinguished from the Israelites by their retired sort of life, and by their contempt of cities and houses. Serrarius distinguishes the ancient Rechabites from the new Rechabites of Jonadab. The injunction of Jonadab laid no obligation on the other Kenites, nor on the other descendants of Jethro. This they continued to observe above 300 years. Jethro began to reign A.M. 3120, and Jethro, king of Judah, was put to death A.M. 3455, B.C. 599; but in the last year of Jethro, king of Judah, Nebuchadnezzar coming to besiege Jerusalem, the Rechabites were forced to take refuge in the city, still, however, lodging in tents. During this siege, Jeremiah received orders from the Lord to converse with the disciples of Rechab, to invite them into the temple, and to offer them wine to drink. But the Rechabites would not accept the offer.

The Rechabites were, probably, led captive, after the taking of Jerusalem by the Chaldæans. (See Psalms lxv.) They returned from their captivity, and settled in the city of Jabez, beyond Jordan. (2 Chron. iv. 25.) Some have suggested, that the Alzidans of the Maccabees, (1 Macc. ii. 42. viii. 13. and 2 Macc. xiv. 6.) were successors and followers of the Rechabites. Others have connected their origin with the city of Rechab, now called Reching, about 100 miles to the north of Jerusalem. They were said to be of the royal family of David, and to be a branch of the Kenites. (See 2 Chron. xiv. 12.) Their language is not known, but they are said to have been a race of shepherds, who dwelt in the wilderness, and were not subject to the government of the Jews. (See 2 Chron. xiv. 12.) They are said to have had their own laws, and to have been governed by a council of elders. (See 2 Chron. xiv. 12.) They are said to have been a race of shepherds, who dwelt in the wilderness, and were not subject to the government of the Jews. (See 2 Chron. xiv. 12.) They are said to have had their own laws, and to have been governed by a council of elders. (See 2 Chron. xiv. 12.)
RECIPIENT, in Algebra, is the quotient arising from the division of unity by any number or quantity. Thus, the reciprocal of \(a = \frac{1}{a}\), the reciprocal of \(\frac{b}{a}\) is \(\frac{1}{b}\), and so on.

**Reciprocal Equations**, in Algebra, are those equations which contain several pairs of roots which are the reciprocals of each other. Thus, an equation whose roots are \(a, \frac{1}{a}\), \(b, \frac{1}{b}\), &c., is called a reciprocal equation. Some authors define reciprocal equations, to be those equations whose coefficients proceed in the same order from both extremes, and respectively equal to each other; thus, \(x^n + a x^{n-1} + b x^{n-2} + \ldots + b x^2 + a x + 1 = 0\), is a reciprocal equation; but this form ought rather to be considered as a necessary property of these equations, by which they may be readily distinguished, than to be employed in the definition of them; it being doubtless the reciprocity of the roots from which they have received their peculiar appellation.

The solution of these equations may always be made to depend upon others of half the original degree, when the equation is of even dimensions; or upon half the dimension minus 1, when it is odd.

Thus far, in fact, this property is not exclusively due to reciprocal equations, as the same may be done in all cases where any familiar relation is known to have place between the roots of an equation, whether by multiplication, division, addition, or subtraction; but in these cases there is nothing in the form of the equation by which such relations may be known to have place, whereas in reciprocal equations their reciprocity becomes immediately obvious by the peculiar order of their co-efficient, these being the same from both extremes, both with regard to sign and magnitude. Hence any equation of the form

\[x^n + a x^{n-1} + b x^{n-2} + \ldots + b x^2 + a x + 1 = 0\]

is immediately known to be reciprocal, and we may proceed in its solution as follows.

First, if the equation be of odd dimensions, as

\[x^{n+1} + a x^n + b x^{n-1} + \ldots + b x^2 + a x + 1 = 0\]

then it is obvious that either \(x + 1\), or \(-1\), is one of its roots, for either \(x + 1\), or \(-1\), substituted for \(x\) according as the signs of the co-efficients may require, will obviously render the whole expression equal to zero, and is therefore a root of the equation. The equation may, therefore, be immediately reduced to another of lower dimensions, by division, according to the known theory of equations; thus, let the proposed equation be

\[x^n - 5 x^{n-1} + 7 x^{n-2} + 7 x^{n-3} - 5 x + 1 = 0\]

Here \(x = -1\) is obviously one of the roots, as this substituted for \(x\) renders the whole equal to zero; and consequently the whole equation is divisible by \(x + 1\), according to the known theory of equation, which division being made, we have, for our reduced equation,

\[x^4 - 6 x^3 + 13 x^2 - 6 x + 1 = 0\]

which is now of even dimension one degree less than the original equation, and still reciprocal. We need, therefore, only consider equations of the latter form; viz. those of which the index of the highest power is an even number.

Let \(x^n + p x^{n-1} + q x^{n-2} + \ldots + &c. q x^2 + p x + 1 = 0\) be any reciprocal equation, whose roots are \(a, \frac{1}{a}; b, \frac{1}{b}; \ldots\), etc.
RECIPECAL EQUATIONS.

Find the two values of \( z \) in the equation \( z^2 + (p - 1) \)
\[ z + q - p - 1 = 0, \]
and call them \( r, r' \); then \( x = -1 \)
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2} \right)^2 - 1}, \]
6th deg. \( x^4 + p x^3 + q x^2 + r x + s = 0 \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

Find the three values of \( z \) in the cubic equation \( z^3 + \)
\[ (q - 3) z + r - 2 p = 0, \]
and call them \( r, r', r'' \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

Find the three values of \( z \) in the cubic equation \( z^3 + \)
\[ (q - 3) z + r - 2 p = 0, \]
and call them \( r, r', r'' \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

7th deg. \( x^3 + p x^2 + q x^2 + r x + s = 0 \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

Find the three values of \( z \) in the cubic equation \( z^3 + \)
\[ (q - 3) z + r - 2 p = 0, \]
and call them \( r, r', r'' \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

8th deg. \( x^3 + p x^2 + q x + s + \ldots + q x^2 + p x + 1 = 0. \)

Find the four values of \( z \) in the equation \( z^4 + p z^2 + \)
\[ (q - 4) z^2 + (r - 3 p) z + s - 2 q - 1 = 0, \]
and call them \( r, r', r'', r''' \); then
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

Find the four values of \( z \) in the equation \( z^4 + (q - 3) z^2 + \)
\[ (r - 3 p) z + s - 2 q + 1 = 0, \]
and call them \( r, r', r'', r''' \); then \( x = -1 \)
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

Find the four values of \( z \) in the equation \( z^4 + (q - 3) z^2 + \)
\[ (r - 3 p) z + s - 2 q + 1 = 0, \]
and call them \( r, r', r'', r''' \); then \( x = -1 \)
\[ x = \frac{r}{2} \pm \sqrt{\left(\frac{r}{2}\right)^2 - 1}. \]

A reciprocal equation of the 10th and higher powers,
requires the general solution of equations of the 5th and
higher powers, and therefore cannot be exhibited analyti-
cally. Bonnycastle’s Algebra, vol. i.

Binomial equations are all reciprocal equations of a pecu-
nular kind, which renders them all solvable by means of
certain trigonometrical formulæ.

Binomial equations are all reducible to the form \( x^n \pm 1 \)
\[ = 0; \] or \( x^n = 1; \) or \( x^n = -1. \) Where it is obvious,
that if \( m \) is even, or \( m = 2 n, \) then \( x^n = 1 \) will have two
real roots, viz., + 1, and - 1; and \( x^n = -1 \) will have
two of its imaginary roots + \( \sqrt{-1} \), and - \( \sqrt{-1} \), so
that, in both cases, such an equation may be reduced two
degrees lower, by dividing it by \( x^2 - 1 \), or \( x^2 + 1 \), and
the resulting equation will be a reciprocal one, having
each of its co-efficients equal to unity. If \( m \) be odd, then
the equation will necessarily have one real root, and no
more, which will be + 1 in the first case, and - 1 in the
second; consequently, such an equation can be reduced but
one degree, the fame as those above stated. We may, there-
fore, find a direct solution for all binomial equations of odd
dimensions as far as the 9th power, and of even dimensions
as far as the 10th power, by the principles and formulae al-
ready given, by merely making \( p = 1, q = 1, r = 1, \) &c.
and it would, therefore, be useless to repeat them again in
this place; we shall proceed immediately to the general
solution of binomial equations, on the principles of analyti-
cal trigonometry.

All the imaginary roots of the equation
\[ x^n - 1 = 0 \]
are
Reciprocal Equations.

are contained in the general formula

\[ x^n - 2 \text{ cof.} \frac{2 \pi}{n} x + 1 = 0; \]

\( k \) being any integer not divisible by \( n \), and \( \pi \) representing the semi-circumference. For it is a known trigonometrical property, that if

\[ 2 \text{ cof.} y = x + \frac{1}{x}; \]

then \( 2 \text{ cof.} n y = x^n + \frac{1}{x^n}; \)

from which two equations we readily draw the following; \( \text{viz.} \)

\[ x' = 2 \text{ cof.} \ y \cdot x + 1 = 0 \]

\[ x'^n = 2 \text{ cof.} n y \cdot x^n + 1 = 0 \]

which have necessarily one common root, being both derived from the same value of \( x \); and since these are both reciprocal equations, if \( x \) be one root, \( \frac{1}{x} \) will be another; they have therefore two roots common, and consequently, from the known theory of equations, the former is a divisor of the latter. If, now, we make \( y = \frac{2 \pi}{n} \), or \( n y = 2 \pi \), these equations become

\[ x^n - 2 \text{ cof.} \frac{2 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} 2 \pi x^n + 1 = 0; \]

But the \( \text{cof.} \frac{2 \pi}{n} = 1, 2 \pi \) representing the whole circumference; therefore the latter equation is the same as

\[ x^n - 2 x^n + 1 = 0, \]

or \( (x^n - 1)^2 = 0, \)

having still for its divisor

\[ x' = 2 \text{ cof.} \frac{2 \pi}{n} x + 1 = 0; \]

that is, the roots of the equation

\( (x - 1)^2 = 0, \) or \( x^n - 1 = 0, \)

are all contained in the general formula

\[ x^n - 2 \text{ cof.} \frac{2 \pi}{n} x + 1 = 0; \]

and, therefore, by giving to \( k \) the successive values 1, 2, 3, \ldots \( \frac{1}{2} (n - 1), \) the following formulae will be obtained; \( \text{viz.} \)

\[ x^n - 2 \text{ cof.} \frac{2 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} \frac{4 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} \frac{6 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} \frac{(n - 1) \pi}{n} x + 1 = 0; \]

which contain among them all the imaginary roots of the equation \( x^n - 1 = 0. \)

And if, instead of making \( y = \frac{2 \pi}{n}, \) as above, we make \( y = \frac{(2k + 1) \pi}{n}, \) our second formula becomes

\[ x^n + 2 x^n + 1 = 0, \] or \( (x^n + 1)^2 = 0; \)

because \( \text{cof.} \frac{(2k + 1) \pi}{n} = -1. \) Consequently, the equation \( x^n + 1 = 0, \) or \( x^n = -1, \) will have for its general factor

\[ x^n - 2 \text{ cof.} \frac{(2k + 1) \pi}{n} x + 1 = 0; \]

which, by substituting for \( k \) as above, becomes

\[ x^n - 2 \text{ cof.} \frac{1 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} \frac{3 \pi}{n} x + 1 = 0; \]

\[ x^n - 2 \text{ cof.} \frac{5 \pi}{n} x + 1 = 0; \]

&c. &c.

which formulae contain all the imaginary roots of the binomial equation \( x^n + 1 = 0. \)

Suppose, for example, all the imaginary roots of the binomial equation \( x^3 - 1 = 0 \) were required.

Here we should have

\[ x^3 - 2 \text{ cof.} \frac{360^\circ}{11} x + 1 = 0; \]

\[ x^3 - 2 \text{ cof.} \frac{3 \cdot 360^\circ}{11} x + 1 = 0; \]

\[ x^3 - 2 \text{ cof.} \frac{4 \cdot 360^\circ}{11} x + 1 = 0; \]

\[ x^3 - 2 \text{ cof.} \frac{5 \cdot 360^\circ}{11} x + 1 = 0; \]

whence,

\[ x = \text{cof.} \frac{360^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{360^\circ}{11} - 1\right)} \]

\[ x = \text{cof.} \frac{720^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{720^\circ}{11} - 1\right)} \]

\[ x = \text{cof.} \frac{180^\circ}{11} \text{ &c.} \]

And if the roots of \( x^3 + 1 = 0 \) were required, we should have from the second general formula

\[ x^3 - 2 \text{ cof.} \frac{180^\circ}{11} x + 1 = 0; \]

\[ x^3 - 2 \text{ cof.} \frac{3 \cdot 180^\circ}{11} x + 1 = 0; \]

\[ x^3 - 2 \text{ cof.} \frac{5 \cdot 180^\circ}{11} x + 1 = 0; \]

&c. &c.

Whence,

\[ x = \text{cof.} \frac{180^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{180^\circ}{11} - 1\right)} \]

\[ x = \text{cof.} \frac{540^\circ}{11} \pm \sqrt{\left(\text{cof.}^2 \frac{540^\circ}{11} - 1\right)} \]

\[ x = \text{cof.} \text{ &c.} \]

For more on this subject, see Barlow's Theory of Numbers, Bonnycastle's Algebra, and our article Polygon.

Reciprocal Figures, in Geometry, are such as have the antecedents and consequents of the fame ratio in both figures. See Plate XII. Geom. fig. 2. Here

\[ A : B :: C : D, \]

or, \[ 12 : 4 :: 9 : 3 \]

That
That is, as much longer as the side A, in the first rectangle, is than the side B of the second rectangle; so much deeper is the side C in the second rectangle, than the side D in the first; and, consequently, the length of one is compensated by the depth of the other.

Also, as the side A is \( \frac{1}{4} \) longer than the side C, so the side B is \( \frac{1}{4} \) longer than D: wherefore the rectangles must be equal.

This is the foundation of that Catholic theorem; that the rectangle of the extremes must always be equal to that of the means; and, consequently, the reason of the rule of three, or golden rule.

For, suppose there were given any three numbers, or quantities, geometrically proportional, as A, B, and C; and, that it was required to find a fourth, D, proportional to them: since A : B :: C : D, therefore A D = B C, and, consequently, \( D = \frac{A B}{C} \); that is, the fourth term is equal to the quotient of the second, multiplied by the third term, divided by the first.

Or, thus in numbers; suppose given \( 12, 4, \) and 9, required a fourth proportional. Now as \( 12 : 4 :: 9 : Q \).

But \( 12 = 4 \cdot 9 = 36 \). Therefore \( Q = \frac{4 \cdot 9}{12} = 3 \),

by dividing both sides by 12.

And hence it follows, that if any two triangles, parallelograms, prisms, parallelepipeds, pyramids, cones, or cylinders, have their bases and altitudes reciprocally proportional, those two figures or solids are equal to one another; and, vice versa, if they are equal, their bases and altitudes are reciprocally proportional.

*Reciprocal Proportion*, is when in four numbers the fourth is less than the second by so much as the third is greater than the first; and vice versa. See *Proportion*.

This is the foundation of the inverse, or indirect rule of three. Thus, \( 4 : 10 :: 8 : 6 \).

Great use is made of this reciprocal proportion, by sir Isaac Newton, and others, in demonstrating the laws of motion.

*Reciprocal Theorem*. See *Theorem*.

Reciprocally, the property of being reciprocal; thus we say, that in bodies of the same weight, the density is reciprocally as the magnitude; *viz.* the greater the magnitude the less the density; and the less the magnitude the greater the density; so again, the space being the same, the velocity is reciprocally as the time, and the contrary.

*Reciprocity*. The law of reciprocity is a term used by Legendre, in his "Theory of the Names," to denote a reciprocal law, which has place between prime numbers of different forms; which is this; that \( m \) and \( n \) being prime odd numbers,

\[
\text{the remainder of } m^2 \div n = \text{the remainder of } n^2 \div m
\]

provided \( m \) and \( n \) are not both of the form \( 4x - 1 \), and if they are both of this form, then

\[
\text{the remainder of } m^2 \div n = -\text{the remainder of } n^2 \div m,
\]

or they will have only contrary signs.

*Recess*, in *Law*. See *Ademption*.

*Recit*, Fr., a generical term in music, for what is sung by a single voice. It is likewise applicable to instruments; as, recit de baffe, recit de hautbois, a solo part for the violoncello or hautbois. Indeed *recit*, in French, seems synonymous with the word *sol* in Italian, to whatever vocal or instrumental part it is applied, in opposition to *tutti*, or chorus, in which the whole band is employed.

*Recit* in France is not only a technical term in music, but in the drama, where, at the opening of a tragedy, or subsequent to an event, it implies an account, a narration, the recital of an event. In the French and Italian tragedies, in imitation of the Greeks, battles and murders are always recited, but never translated on the stage.

*Recitativo*, in *Laus*, the rehearsal, or making mention, in a deed or writing, of something which has been done before.

*Recitativo* is not conclusive, because it is no direct affirmation; and by feigned recitals in a true deed, men might make what titles they pleased, since false recitals are not punishable. If a perfon, by deed of allignment, recite that he is possesfed of an interest in certain lands, and assign it over by the deed, and become bound by bond to perform all the agreements in the deed; if he is not possesfed of such interest, the condition is broken; and though a recital of itself is nothing, yet being joined and considered with the rest of the deed, it is material. And where it is but a recital, that before the indenture the parties were agreed to do such a thing, it is a covenant, and the deed itself confirms it. The recital of one leafe in another, is not a sufficient proof that there was such a leafe as is recited. But the recital of a leafe in a deed of release, is good evidence of a leafe against the releflee, and those who claim under him. A new revocracy leafe shall commence from the delivery, where an old leafe is recited, and there is none, &c. *A* recites that he hath nothing in such lands, and in truth he has an eftate there, and makes a leafe to B for years; the recital is void, and the leafe good.

In this case, if the recital were true, the leafe would not bind.

*Recitation*, the act of reciting, or delivering a discourse, either in the way of narration, rehearsal, declamation, or the like.

*Recitativo*, It., *Recitative*. The Cursi Dictonary gives no more early authority for the use of this word, as a musical term, than that of Batifta Doni, de Preilt. Mus. Veteris, published in 1647; who defines it, "a musical composition in an andante or plain style, different from air; it is used in narrative poetry, in imitation of reciting on the stage."

Roulleau's definition is more full and clear. He terms it "a discourse, or speech, in musical and harmonical tones. It is a melody nearly approaching to common speech; a musical declamation, in which the musician ought to imitate, as much as possible, the inflections of voice in declaiming. This melody is called recitative, because it resembles a narration, a recital; and is used in the dialogue of musical dramas."

We have presented our readers, under the article *Opera*, with extracts from the prefaces of the poets and composers by whom recitative was invented, as well as from contemporay writers, who thought its origin of sufficient importance to be recorded.

Giovanni Batifta Doni, about the middle of the 17th century, (Op. Om. tom. ii. in Firenze, 1763, folio,) a learned and elegant writer on music, though extremely warped in his judgment by a predilection for the music of the ancients, in a dissertation on the Origin of Stage-singing, during his own time, gives so curious and instructive an account of the first operas that were performed at Florence, that we shall translate a part of it.

"Some kind of cantilena, or melody, has been introduced in
in dramatic representations, at all times, either in the form of intermezzi (interludes), between the acts; or, occasionally, in the body and burthen of the piece. But it is still fresh in the memory of every one, when the whole drama was first set to music, and sung from the beginning to the end.”

The revival of theatrical music was brought about by the invention of recitative, as we have already itated in our article Opera.

“The beginning of this century (1600) was the era of musical recitation on the public stage at Florence, though it had been used there in several private exhibitions before. There reeded in that city, during these times, Signor Gio. Bardi de Conti di Verno, who was afterwards called to the service of pope Clement VIII., by whom he was tenderly beloved, and made his madrigal di camera. This most accomplished nobleman was particularly attached to the study of antiquity, and to the theory and practice of music, to which he had applied himself for many years so closely, that he became, for the time in which he lived, a correct and good composer. His house was the constant rendezvous of all persons of genius, and a kind of flourishing academy, where the young nobility often assembled to pass their leisure hours in landable exercises and learned discourse; but particularly on musical subjects, when it was the wish of all the company to recover that art of which the ancients related such wonders, as well as other noble inventions, which had been ruined by the irritations of barbarians.

“During these discussions, it was universally allowed that as modern music was extremely deficient in grace, and the expression of words, it became necessary, in order to obviate these objections, that some other species of cantilena, or melody, should be tried, by which the words should not be rendered unintelligible, nor the verse destroyed.”

Euridice was the first musical drama after the invention of recitative. It was written by Ottavio Rinuccini, set by Jacopo Peri, and performed at Florence in 1600, on occasion of the marriage of Mary of Medicis with Henry IV. of France. The poem and the music were published separately the same year. The poet, in his dedication to the queen of France, says, “It is generally imagined that the tragedies of the ancient Greeks and Romans were entirely sung; but this noble kind of singing had not till now been revived, or even attempted, to my knowledge, by any one; and I used to think, that the inferiority of our music to that of the ancient was the cause; till hearing the compositions of Jacopo Peri to the fable of Daphne, I wholly changed my opinion. This drama, written merely as an experiment, pleased so much, that I was encouraged to produce Euridice, which was honoured with full more applause, when sung to the music of the same composer Jacopo Peri, who with wonderful art, unknown before, had merited the favour and protection of the grand duke our sovereign, it was exhibited in a most magnificent manner at the nuptials of your majesty, in the presence of the cardinal legate, and innumerable princes and nobles of Italy and France.”

Such is the abridged history of recitative. The only printed copy of the music to this primitive opera was in the library of the marchese Rinuccini, a descendant of the poet at Florence: in examining and making extracts from which, we observed that it was printed in fcore, and barred; two very uncommon circumstances at the time of its publication; that the recitative seemed to have been not only the model of subsequent composers of early Italian operas, but of the French operas composed by Lulli, a native of Florence; and that the time was as frequently changed as in the old French operas.

The confusion arising from all the parts singing different words at the same time, together with some other circumstances, mentioned under Opera, account for the necessity of a recitative, or a musica parlante, a speaking music, and for solo singing in general on the stage: besides, poetry was injured, and rendered unintelligible in fugues, canons, and in choruses, full of imitations and contrivances, all unfit for narration and dialogue.

To describe the characteristic difference of recitative from air, and common speech; it is not air, as no time is kept; it is not speech, as every inflexion of voice is in tune with some one note of the instrument by which it is accompanied; and as to the length or shortness of the notes that are written, the accompanier watches for the accents or termination of phrasal, or lines in the verse, to give the chord to which the note that is sung belongs.

It is sometimes accompanied by the orchestra with ritornelli, or interlithical symphonies; but then a regular time must be kept. This only happens in solemn scenes of dignity or diffuseness, and in folellos.

No flats or sharps are placed at the clef in recitative; these are all regarded as accidental; nor is Italian recitative ever confined to any one key.

After recitative was found, it was long ere any thing like an air appeared in these musical dramas. (See Opera, Air, Motivo, and Measure.) Roussel has treated the article recitative at large, with great intelligence and good taste.

Recitative Style, is the way of writing accommodated to this sort of music.

RECIV, LA, in Geography, a well-fortified town of Brazil, in the jurisdiction of Ferneambuco.

RECKENITZ, a river which separates the duchy of Mecklenburg from Pomerania, and runs into a lake, which communicates with the Baltic near Ribnitz.

RECKHEIM, or REKUM, a town of France, in the department of the Lower Meuse, which gives name to a county, situated on the W. side of the Meuse, and surrounded by the bishopric of Liege; 7 miles N. of Maestricht.

RECKLING, in Rural Economy, a provincial word, signifying the tail of the farrow or brood of pigs, poultry, or other farts of domestic birds.

RECKLINGHAUSEN, in Geography, a town of Germany, fortified by a castle, and capital of a county of the same name, which is situated between the bishopric of Munster, the duchy of Cleves, and the county of Mark; 16 miles S.S.W. of Munster.

RECKON, in Rural Economy, a term sometimes applied to a pair of pot-hooks of a certain make, occasionally employed in dragging wells, ponds, &c.

RECKONING, in Navigation, the act of estimating the quantity of a ship's way; or of the distance run between one place and another.

Or, more generally, a ship's reckoning is that account, by which at any time it may be known where the ship is, and on what course or courses she is to steer to gain her port. See Log-Board, Log-Book, and Journal.

This is usually performed by means of the log-line; the manner of applying which, see under its proper article, Log-Line.

Yet this is liable to great irregularities. Vitruvius advices an axis to be passed through the sides of the ship, with two large heads projecting out of the ship, in which are to be included wheels touching the water, by whose revolution the space passed over in any given time may be measured. The fame has since been recommended by Snellius; but
but there are few who have written of navigation, that have not shown the insufficiency of this method.

RECKONING, Dead. See Dead Reckoning.

RECKSON, in Geography, a town of Bengal; 6 miles E. of Calcutta.

RECLAIMING, or Reclaiming, in our Ancient Customs, the action of a lord purifying, professing, and reclaiming his vassal, who had gone to live in another place, without his permission.

Reclaiming is also used in a similar sense, for the demanding of a person or thing to be delivered up, or surrendered, to the prince or state it properly belongs to; when, by any irregular means, it has come into the possession of another.

Reclaiming, in Falconry, is the calling of a hawk, or bird of prey, back to the fill.

The sparrow-hawk, goshawk, &c. are reclaimed with the voice; the falcon only by flaking the lure. So that the term turling, with regard to the falcon, is more proper than reclaiming.

The partridge is also said to reclaim her young ones, when she calls them together upon their scatttering too much from her.

Reclaiming is also used for taming animals that are wild by nature.

Reclaiming, in a monastic fenne. See Religious.

Reclaiming Lands, in Agriculture, the business of refloping and bringing them into a state of cultivation and improvement. There are various kinds and flates of land, which admit of this fort of amelioration and improvement; as among the wet forts, all thofe of the bay or elfuary description, which are washed and occasionally covered by the sea or other waters; different defcriptions of fent lands, and thofe of the more firm marchy nature, and thofe in more interior situations, which are of a loofe swampy or watery quality, as marshy and boggy grounds. And among thofe of the more dry, hard, watery, and wild defcriptions; all the varieties of the rough rocky forts of unimproved lands; the many different kinds of rough woody grounds; and the numerous forts of moory lands, as well as other varieties, which are now and then to be met with in particular circumfiances and situations.

The fill of the wet or watery forts of land, noticed above, are far from being always ready, or in a ripe flate for admitting improvement of this nature; yet in different ficulties and circumfiances, they occasionally permit of its being accomplished, withoUt any great difficulty or trouble. See Embankment, and Embanking against the Sea.

The fanny and marshy lands, where, in the former, they are wholly or only in a partial manner overgrown by ufelefs aquatic plants; and in the latter, become fo firm as to bear a pattering flock, and to afford nutritional herbage for their growth and fupport, but are notwithstanding flill liable to be overflowed by high tides, or land floods; are, of coarse, capable of very great improvement in the above ways, as well as by many other means. See, Fen, Fenney Lands, Marshy Land, and Salt Marsh.

These forts of watery lands are not incident to the flat bays and inlets of the sea-coasts, or the mouths of the larger rivers, in a particular manner; but are met with in the more inland circumfances of the country, accompanying the larger rivers and waters in the more central parts of the kingdom: consequently such forts of improvement must be very extensive in their nature, and of very great importance to the nation.

The other kinds of swampy watery lands, which are liable to be covered with that fluid during wet feafons; thofe on the fides of lakes and ponds; the morasses which are choked and grown up with aquatic vegetation, fo as to have some fort of hardifh crust formed upon them; and the soft boggy lands, formed in somewhat familiar ways, are all capable of allowing great improvement, by fuitable draining, and other methods of management. See Spring and Surface Draining, Swamp, Bog, and Morass.

Lands of the above kinds are mostly met with on the lower flopes, or at the feet of hilly grounds; being caufed by the flagration of water in their internal parts, which has the effect of chilling and rendering them too moif for the production of a nutritious and useful herbage, as well as of promoting the growth of coarse plants of the aquatic nature, though their circumfances may occasionally have some degree of relative height.

There are many valuable tracts of land of thofe kinds, in many different parts of the illand, which have been already reclaimed by thofe methods of proceeding; which fhoul have the effect of stimulating the owners of fuch lands in other places, where they flill remain unimproved, to exert themselves in getting them reclaimed.

Among the more dry kinds of unimproved lands, the fill, or thofe of a rough, itony, waite quality, are all thofe in the vallies of hilly or mountainous tracts, on the skirts or lower parts of mountainous heights, and the rough itony lands, fit for cultivation, in other circumfances. They are the most readily reclaimed and improved, in the lefs hilly forts of lands and circumfiances. In fome caves, where the surfaces of the ground were in a great meafure covered by large rocks and itones of great fizes, very hard in their qualities, and of fcarcefly any value, the lands have been reclaimed, and brought into an arable state, and let for high rents: the itones which were removed paying, in a great degree, the expences of the labour; they being exported and fold as paving-tones, and for other ufe to the metropolis. And though this cannot always be done, it fhews what is capable of being performed by industry and perfeverance; and that, where surface itones can be turned to ufeful purpofes, the most rugged and barren lands may be reclaimed with advantage, under proper modes of management. In fuch circumfances, instead of leaving the surfaces of the grounds in worfe ftates than they were before, by being taken up with pits, and heaps of ufelefs rubbifh, which buried the better moulds, as is common in working superficial quarries, the pits and other hollows were levelled, and filled up to fome height, with the coarse and rubbifh materials produced in the courfe of the works, and the finer mould from other parts thrown back upon the above rubbifh materials, fo as to form an even top-foil; the larger spaces of the ground being trenched over to a good depth, leaving the belt foil on the surface. It is fuggested, that by following fimilar easy methods of management, in carrying on other undertakings of the fame kind, lands of a value in proportion to that of the materials which are removed, may commonly be created, without incurring any very great expence. Hence it is thought to behave thofe who have the direction and management of landed eftates, that comprehend grounds of thofe forts, to examine and consider well whether the itony materials which they contain, and encumber their surfaces, cannot be turned or converted to some profitable purpofe, by the means of roads, iron railways, canals, or fome other easy mode of conveyance for fuch heavy substances.

It must be noticed, however, that the method of levelling and trenching over the lands by the fpade, in fuch circumfances, can only be practifed in a very few cafes, where labour is particularly cheap.

There is another description of itony lands, of a much less
lefs formidable nature, which frequently stands in need of being reclaimed, and in which the surface is lefs encumbered than the interior parts of the soil. In these cases, the interrupting materials are rather large stones than rocks, though the latter may sometimes in part form them. The means which are best suited to the bringing of these into a profit-
able state of cultivation, are to be found in the more northern parts of the island, in the practice and exertions of particular spirited individuals. The plan of the improvement is perfectly simple, but it is expensive in its performance; the whole of the lands being turned over by means of the spade, to a proper depth, as from one to two feet. The stones which are not wanted for use are thrown into pits, and the hollow parts, to contribute to their being made level, and sometimes into the deep trenches formed in digging, being first covered over with the worst of the earthy materials, upon which the better moulds and turfy sub-
stance, which are flirred in the work, are spread out as a foil, by which the whole is rendered very suitable for agricul-
tural purposes.

The cost of reclaiming lands in this way depends, in some measure, on the ease of surface in the lands, the nature of the interrupting matters, and the depth of the earthy sub-
fstances to be removed, in raising a sufficiency of mould for forming the surface foil: but from five to twenty pounds the acre may be considered as the limits of the charges.

And this, it is supposed, leaves an ample profit in the sale of such lands, or otherwise, in these situations where tythes are not taken, and where the rates and taxes are so very few and trifling, and where labour and living is so cheap. It can now, however, be done in this manner in but few instances, as has been already noticed.

It is, notwithstanding, believed that there are very many lands, not only in these northern parts, but in England and Wales, that would more than repay the expenses of this spirited mode of improvement. It may be remarked, that where the stones are very large, or where fragments of rocks are met with, in these undertakings, they may be got rid of either by blasting, or rendering their upper parts, or by linking them in the foil, so as to allow the plough to pass over them with safety.

The former method is more suited to the soft sorts of stones; the latter to those of the harder kinds.

Such rocky grounds as are common in hilly and moun-
tainous situations, which, on account of their climate, and the compact nature of the rocky materials, as well as their quantity, are incapable of being cleared as corn-lands, or so as to admit the plough, may often be reclaimed and improved as pastures lands for sheep, &c. or sometimes as hay lands. The plan of proceeding, in these cases, is that of removing the flinty matter from the surface, and allowing it entirely to the growth of grassy herbage; the means of accom-
plishing which are similar to those already noticed, but the cost considerably less: the main intention here being merely the smoothing of the surface ground, for the pur-
poses of pasturing or mowing: but the more the flinty sub-
fstances are covered with good earthy mould, the better and greater will be the quantity of produce. See Til-
lage.

There are many rough woody tracts of ground, of the shabby or other kinds, which may be cleared and reclaimed with vast advantage to their proprietors, as well as the com-
munity in general, as corn-lands, or for other uses. The most usual method of accomplishing this sort of improve-
ment has been to dig out the whole of the roots, whether of low woods or timber woods, at the time of removing the tops, so as to admit the plough immediately. In perform-
ing this in this way, however, where the flooris are of the timber kind, numerous and large, deep breaking of the ground is often necessary, which is laborious and expensive; and rotten wood, mould, leaves, and other surface matters, are apt to be left in mixture with the fertile or poisonous sub-sera. As lands, cleared and reclaimed in this manner, have been known to remain in a raw unprofitable condition, for several years, although limed, dunged, and raised in sharp ridges, in order to its amelioration.

This improper practice has consequently been highly disadvantageous, injurious, and ruinous, and thrown much difficulty and interruption in the way of clearing and reclaiming such waste lands for the growth of corn, however suit-
able they may be for the purpose in the nature of their soils and situations, thereby tending to propagate and support the notion, that such sorts of land will not repay the ex-
penses and trouble of being improved.

But from attending to what has naturally happened to the cleared parts of wood-lands, it will be seen that a depth of fertile mould, resting on lefs fertile substanstes, form a regular foil and sub-foil, which are free from the roots of trees, ready to receive the plough, and afford corn crops in due succetion. This is supposet to take place somewhat in this way. The trees having been suffered to become decayed, or more properly cut down in due season, and the brash or underwood cut and cleared away from time to time by the occupiers, while such commons or other places were fully or too much stocked with cattle and sheep, the young shoots were of course browsed off and nibbled away, quite to the stumps, consequently weakenet, and at length finally destroyed. The roots and other parts of them followed this course, and pulled into a foilte of vegetable mould, in-
creating and enriching the foil at the same time. Nay, this may, in the natural state, it is supposet, be, in some me-
asure, effected alone by the grazing animals, as it is essential to their exilence.

This natural process, however afflieted in this way, is flow, requiring a length of time for its completion; yet by proper means of art, well applied, it may be accomplished in a few years; the larger roots being extracted from the ground, instead of waiting for their reduction by a slow decay, without any unnecessary disturbance of the sub-foil; and then filling in the pits by the rough buried of the natural surface; by which means the cleared ground will be smoothed, and made fit in due time for being cultivated. Where the surface is much encumbered with leaves and rotten woody matters, they are to be raked up, and put into heaps to decay; or they may be burnt, and the ashes spread out over the surface of the land. Proper draining and fur-
ther levelling multt likewise take place, where necessse; as well as harrowing or hacking the surface (ward, so as to fow it with proper grafts seed; again raking off any rubbish that may arise, and then rolling the whole quite smooth for mowing. It should be stocked hard, especially with sheep, mowing off occasionally any woody shoots that may be per-
mitted to arise; keeping the whole in the state of clofe pat-
turage, until the smaller roots, which were left, be so decayed as to become obedient to the plough-share. At this period, but not before, such pasture ground may be broken up for grain crops in proper succession.

The proceeds might be haled by the use of lime, or other calcaeous matters in union with the vegetable sub-
fstances which were removed, as they would be sooner dis-
folved or reduced, and the compost be more rich. And by sreading them out on the land a simitar effect might be produced, and a finer sort of herbage be encouraged, which would cause a clofer bite, and sooner bring the land into a more
more thick let state of sward, which is the prolific matrix for corn crops.

The really necessary expense of reclaiming and bringing these kinds of wooded lands into a state of cultivation, by these means, is inconsiderable, particularly where fuel is dear. Where the timber wood is properly cut down by the axe, and the underwood taken off rather below the surface, the larger roots, and the stumps which are left, will, in some instances, more than repay the cost of the clearing and levelling the surface. And the other expenses will be repaid by the immediate production of a suitable ground, the value of which is constantly increasing without any further charge, until it may probably be worth two or three times what the lands were while they were in the woody condition.

In cafes where fuel is cheap, and particularly when the timber wood is rapidly fallen, as in the barking lea, they may be cut off by the law level with the surface of the land; the tools and large superficial roots being after that carefully diskarded to some inches within the ground, so as to prevent their throwing out shoots to injure the surface and keep the roots alive. In this way the tools will be so decayed in a few years as to be capable of being removed with little trouble or expense. See Tillage.

In clearing and reclaiming moory lands where they are too wet, the first step is that of properly draining them; they are afterwards brought into cultivation and to their full value by other means, such as in large undertakings, by suitable divisions of the lands into fields proper for the farm or farms to which they are to be let, and so ditched that the surface water may be effectually taken off, without having deep, open, expensive troublesome drains in other parts; the surface of each field being adjusted in such a manner as to shoot off the rain water into the intersecting ditches, in order to prevent injury from happening, in that way, so as to impede the cultivation for any length of time.

As the surfaces of these kinds of land are mostly rugged and uneven, as well as of a loose spongy texture, which unfit them for the tillage processes, without previous affluence from hand labour; where the moory earth, or vegetable mould, is deep, and rises to the surface uncovered by fossil matters, some length of time is requisite to bring it to that solidity and firmness of texture which is suited to the common arable purposes. Hence the general principle of improving deep moory lands, where there is no fossil covering, is supposed to be the same as that advised for bringing woodlands into cultivation; namely, that of converting them to a profitable state of herbage, before corn crops are attempted to be produced.

The process must be guided and regulated by the nature and situation of the tract to be improved. Where the surface is very irregular, full of inequalities, and of an abrupt nature, it must first be adjusted so as to admit the means of tillage when they can be properly had recourse to, and for carrying away the surface waters in the manner already noticed. Then to pare off the lesser hillys and risings, as the tufts and hillocks which were formed during its wet state, and more or less of its general surface, so as to remove the coarse plants and flake mould which occupy it, and thereby produce a fresh face in the whole.

In dry seasons, when the surface has sufficient firmness to bear the tread of animals, the paring may be done by the plough for that purpose, but in other cafes by the breast-plough or paring-fpade. When the surface has been cut over in this manner, and any part has the appearance of being too wet, as may be judged of by the colour of the mould, in some degree, covered drains are to be formed in such places, which may commonly be made in a cheap and durable manner by the firm fibrous tufts collected from the surface. The rest of the roots and mould which were pared off should be burnt, and their ashes spread evenly over the surface, being immediately raked or harrowed into the soil. At this period of the improvement almost any kind of fossil material can be thrown over the ashes at a little expense; and a full quantity of different fossil seeds be covered in with it; leaving the surface to take on a sward without any further trouble or outlay of money.

Afterwards the grassy herbage is to be kept closely fed down when the weather will permit, first by sheep and then by heavier farts of stock, until the surface becomes firm and the soil is well bound together by the fibrous roots of the herbage, so as to be capable of affording corn crops in proper succession.

It has been objected to this summary mode of bringing the land into the state of herbage, that there are no immediate gros returns for the money laid out in reclaiming and bringing it into the cultivable state. But although corn cannot be raised on such raw loose-textured forts of land at first, potatoes are found to answer well, and rape with still more advantage in its culture, the labour attending it, and the profit which it affords. See Moor, Moory-Land, Spring and Surface Draining, &c. See also the Inverness-shire Agricultural Report.

The reclaiming and bringing lands of these several different descriptions into a state of cultivation and improvement is evidently a work of very great importance, particularly in a country where the population is getting too numerous for the produce, as by such means the extent of agricultural territory may be suitably laid to be increased. Extensive improvements of these kinds have lately taken place in Cornwall, and some other southern districts.

Reclaiming Plantations and Timber Woods, in Rural Economy, the restoring of such as have grown into a wild, neglected, and improper state from some fort of mismanagement, or want of attention. The caufes which have a tendency to produce this effect are very numerous, and have been the means of vall individual as well as national loss. One material and very frequent cause is the neglect of their boundary fences; another is the mistaken notion of its being the best practice to leave them entirely to nature after they are once properly planted; a third is the very absurd supposition, that nothing should be done to them for a length of time after planting, in the way of rendering the trees more thin among themselves, or in their branches; and lastly, an universal carelessness and disregard of them, frequently from the narrow conceptions of expense being incurred without the chance of any immediate return of profit. It is, on the whole, much too common to take great care in first forming the plantations, without ever thinking or taking any fort of interest in their after-management. But the business is by no means accomplished in the simple act or operation of planting out the trees. Good examples of this kind of management are indeed few, but they occasionally exist, and much has been written on the matter, so that information may be readily obtained. And there is every inducement to get it; as well prepared, inclosed, planted, cultivated and managed plantations, will far outgrow others that have existed for a much longer time, but have been otherwise treated, often affording more than woods of three times their length of standing.

In directing the proper management in all cafes of this nature, some attention must be paid to the particular kinds of the plantation which they may be, in the first place; after which, the means of reducing them to their appropriate states, or to some other in the most easy and convenient manner, Vol. XXIX.
manner, may be taken into consideration. It may often happen that their proper originally intended states cannot be attempted, but that which has been gradually acquired must be promoted. With a view to the accomplishment of these intentions, plantations may be considered as consisting either of hard woods only, of evergreen or resinous trees only, or of both these sorts of trees in mixture.

In the first of these kinds, or those which are composed solely of the hard-wooded sorts of trees and plants, where they are to be brought to the state of woods, as timber and underwoods, and the latter to be used only as fuel, the good trees of such kinds as are suitable to the soil, and the probable demand of the vicinity and other parts, should be fixed upon, and left as standard trees; the whole of the others being cut over by the surface of the ground, so that they may become tools for supplying the under-growths. When this has been performed, the ground, where necessary, should be dug, hoed, or trenched over, as circumstances may direct; but where the trees and underwoods have been much crowded, these kinds of work will seldom be required. However, if, instead of the common underwood, oak be required, then after pitching upon the most proper and suitable standard trees for remaining, the whole of the rest are to be taken up by the roots, the land dug over, and acorns planted out upon it; which, when they are grown up, must be kept clean and free from weeds for some years, in order to promote their healthy growths and rising to the state of young trees.

Where the whole is to be reduced to the state of copse wood for fuel only, the belt way is to cut over every part by the surface of the ground; and when for bark, to root out the whole, only referring the oaks, and planting with acorns, as already noticed.

In the second sorts of plantations, where they have remained, after planting, without being in any way thinned, for a great many years, they are often, in a great measure, incapable of being remedied, as they are, for the most part, so impoverished by other causes, that their growth is suspended; whereas any thinning takes place, the trees all around are destroyed. In these cases it is the advice of some to have the whole grubbed up by the roots and replanted, after the ground has been properly prepared by fallowing and repeated corn crops. But as there may sometimes be much loss in this way, it may be proper to try the cautious thinning of them, which should be done during the latter summer months in a careful manner, as success has occasionally attended this method.

With natural plantations of this kind under twenty years' growth, and artificial ones under ten, much advantage has been gained by suitable cautious thinning and retrenching. In all these cases there is no necessity whatever for the cultivation of the ground, as the trees suffer few or no plants to rise below them, and besides, injury may be done to their superficial roots.

The management in the last or mixed kinds of plantations, where the evergreen trees are in such proportions as not to admit of either of the above modes, is to reduce them to the grove plan only, or to this in some parts and the wood kind in others; the modes of accomplishing both of which have been already laid down. However, in each of these methods, it will frequently happen that the tree or trees which are the most advantageous and defirable in the parts where the plantations exist, are either very deficient, or wholly wanting. In all such instances it is probably the best and most beneficenti practice to grub up nearly the whole of such trees, and replant the ground with the proper sort or sorts; care being taken to leave such a number of the old trees, either in a scattered manner, or in narrow stripes and screens, for sheltering and protecting the young trees, plants, and feeds, which have been put in, planted, or sown. See PLANTATION and Wood.

It may be noticed that in reclaiming all kinds of wild and neglected plantations in lands which are inclined to the retention of moisture; the first thing which is necessary is invariably that of the removal of the flagrant wet woods, as where this is not properly performed, the other operations will be of but little avail, however well they may be executed. In many extensive tracts of this nature, the injury which is sustained by this fort of neglect is scarcely to be calculated. There are many thousands of acres, in different situations in this country, which would by this means alone be brought to twenty times and more their present value. And as this fort of work in such cases can, for the most part, be accomplished by open cuts or gutters alone, at a very trifling expense in comparison of that for arable and some other sorts of land, it should never be neglected where good management is in the least degree attended to. See SPRING and SURFACE Draining.

It is a material point in reclaiming all these sorts of plantations and timber woods, to keep the surrounding ditches and fences well up and in a proper safe state, as large tracts are often completely ruined in a very short time by inattention in this respect, from the cropping, rubbing, and defraction in other ways produced by the entrance of cattle of different kinds into them. There is hardly anything so injurious to the more young timber plantations as cattle being suffered to get into them. See FENCE.

The retrenching of old ill-managed plantations of these kinds should con tinually be done in a very gradual manner, having due regard to their length of standing, the nature of the trees, the quality of the land, the situation and exposure, as well as some other points. Their outside parts are in general to be left more thick and close, than those which are more in the interior, and the parts of the foil which are of a bad thin quality, should be left less thick of trees and plants than where it is of greater depth and richness. And open exposures should be kept more thick and close than where they are more warm and sheltered.

In retrenching the branches of the different trees, the work should be performed according to the length of time the trees have been growing, their particular growths and sizes, the difference of kind, and the uses, purposes, and intentions for which their wood or other parts are designed. It is always proper to stop rather short, than to carry it to an extreme, as there is sometimes danger in the latter case. See PRUNING.

It is always necessary and essential to reclaim these old wild sorts of plantations as soon as possible, as the forming of new tracts of this kind chiefly benefit poltery, while the ameliorating and improving of the other, by these means, are an immediate and direct gain to the present proprietors, of very great national importance at the present time, and which would otherwise be complete losses to both.

No forts of woods of the timber kind should indeed ever be suffered to remain any great length of time without being properly looked over and put into such states as that they may go on in the most beneficent and profitable manner, as
where they are in any way or by any means restricted or impeded in their growths, there is a constant and continual loss taking place, and the ultimate disadvantage is prodigiously great, as the timber never becomes either so good or in such quantity; of course it is of inferior value in both respects, which makes a difference of much consequence to the proprietors as well as to the nation at large. See Wood.

RECLINATION of a Plane, in Dialling, the number of degrees which a dial-plane leans backwards, from an exactly upright or vertical plane, i.e. from the zenith.

The reclusion is easily found, by means of a ruler, and a quadrant; for having drawn an horizontal line on the plane by a level or quadrant, and to it another line at right angles, apply a ruler, so that one end of it may hang over, or reach beyond the plane; then will a quadrant, applied to the under edge of the ruler, shew the degrees and minutes of the plane's reclusion; counting from that side of the quadrant that is contiguous to the edge of the ruler.

RECLINATUM Folium, in Botany, a leaf whose point is curved downwards, below the level of the base. See LEAF.

RECLINATUS CAULIS, a reclined stem, is bent towards the earth, as in many species of Ficus, Salis, Rubus, &c.

RECLINER, or RECLINING Dial, is a dial whose whole plane reclines from the perpendicular; i.e. leans from you when you stand before it.

When this reclusion is equal to the height of the pole, the dial is said to be equinoctial. See DIAL.

RECLINER, Declining, or Declining reclining dial, is a dial which neither stands perpendicular, nor opposite to one of the cardinal points. See DIAL.

RECLUSE, among Religious, a person close shut up in a very narrow cell of an hermitage, or other religious house; and cut off, not only from all conversation with the world, but even with the house.

The word is chiefly used for such as thus imprison themselves out of devotion, to do penance. It is sometimes also applied to incessant wives, whom their husbands procure to be thus kept in a perpetual prison in some convent.

Recluses were anciently very numerous; they were then a kind of solitaries who shut themselves up in some little cell, with a vow never to stir out of it.

None were admitted to this oath until they had given sufficient proofs of their abstinence, and had leave from the bishop, or the abbot of the monastery where they were shut up; for the cells of the recluses were always to join to some monastery.

The prelate's permission being obtained, they were tried for a year in the monastery; out of which, during that time, they never flirted.

They were then admitted to their vow of stability in the church before the bishop; which being done, and the recluse having entered his little cell, the bishop set his seal on the door.

The cell was to be very small, and very exactly closed. The recluse was to have every thing within it necessary to life; and even, if he were a priest, an oratory consecrated by the bishop, with a window which looked into the church, through which he might make his offerings at the masts, hear the singing, sing himself with the community, and answer those who talked to him. But this window was to have curtains before it, both within and without; so that the recluse might neither see, nor be seen.

Indeed he was allowed a little garden in his reclusion, to plant a few herbs, and take fresh air; adjoining to his cell was that of his disciples, which he was very rarely without; with a window, through which they served him with necessaries, and received his instructions.

When it was judged proper to have two or three recluses together, their cells were made contiguous to each other with windows of communication; if any woman would confute them, or confess to them, it was to be in the church, and in the face of all the world.

Where there were two or three reclues together, they were never to hold any conference, but on spiritual matters, and to confes to each other; where there was but one, he was to confes and examine himself.

If the recluse fell sick, his door was opened for people to come in and affilt him; but he was not allowed to stir out on any pretence whatever.

These articles are extracted from the rule, compiled for the reclues, by Grimlaic, a priest in the ninth century.

There were also women reclues, who led the same life, in proportion. St. Viborade lived a recluse at St. Gall, and was there martyred by the Hungarians in 825.

RECLUSION, the state of a recluse; or the cell and other appurtenances of it.

F. Helyot gives a particular account of the ceremonies practiced in the reclusion of a woman, in that of mother de Cambrai, infallitrix of the order of the representation of Nôtre Dame. A cell being built for her in 1625, adjoining to the church of St. Andrew, in Tournay, the bishop waited for her early in the morning at the church-door. Upon her arrival, prostrating herself at the feet of that prelate, he gave her her benediction; conducted her to the grand altar; and there blessing a mantle, veil, and cappaular, he put them on her, and gave her a new name.

Having here made her vow, and the bishop having arranged the people in praiue of the new recluse, he conducted her processional to her reclusion; the clergy all the way singing Veni, Sponfa Christi, &c.

Here the bishop, blessing her aforehand, consecrated the reclusion, and shut her up in perpetual confinement.

RECOGNISANCE. See RECOGNIZANCE.

RECOGNITION, Recognitio, denotes an acknowledgment. The word is particularly used in our law-books, for the title of the first chapter of the tit. 1. Jac. I. by which the parliament acknowledged the crown of England, after the death of queen Elizabeth, to have rightfully descended to king James.

RECOGNITIONS of Clement, in Ecclesiastical History, a suppedititious or apocryphal book, ascribed to St. Clement, but really composed by some learned and eloquent man in the second century. Rufinus, who translated the ten books of Recognitions out of Greek into Latin, in whose translation only we now have them, plainly supposes them to have been written by Clement of Rome; but that the copies, in his time, had been corrupted in some places. The first ecclesiastical writer who has mentioned this work is Origen, by whom it is cited twice; but he does not seem to have held it in high estimation. Eusebius, who is supposèd to mention the Recognitions under the title of "The Acts of Peter," which made part of them, rejects them, and owns no work for St. Clement, but his epitoke to the Corinthians. Epiphanius mentions "The Travels of Peter" as written by Clement, but corrupted by the Ebionites, so that little was left that is genuine. St. Jerome's opinion of the works of Clement coincides with that of Eusebius. This book is, for a large part of it at least, says the learned Dr. Lardner, a fiction or romance, in which divers things concerning the Christian religion are represented in a philosophical manner, in order to render them more agreeable to the Greeks. It
is called the "Circuits," or "Travels and Acts of Peter," from its subject, as it contains an account of the apostle Peter's disputes with Simon Magus, and his discourses to other people, and his miracles. It is called the "Recognitions," from Clement's recognizing his father, and mother, and brethren, who had been long separated from each other.

Mr. Whilton, though he allows that this work was not written by Clement himself, supposes that it was the production of some of the hesers of Clement, and other companions of the apostles; but Dr. Lardner is of opinion, that it must be reckoned to Clement's, or to be suppliational. With regard to the age of this work, Lardner further adds, that the arguments here urged against Heathenism seem to imply, that the Christian was not yet the prevailing established religion. And the author often speaks of the power of Christians to heal diseases, and to expel demons, as if it was common in his time. That such gifts were enjoyed by many Christians in the second, and in the beginning of the third, century, we are assured by Irenæus, Tertullian, Origen, and others; after which time, or however after the end of the third century, they were not so common, if they did not quite cease. Mr. Whilton's opinion of this book is, that if it be not, in some fene or other, itself a sacred book, yet it ought certainly to be esteemed in the next degree to that of the really sacred books of the New Testament. But in the opinion of many other learned men, it is a worthless piece, of little or no use. It contains, however, as Dr. Lardner admits, some excellent sentiments, and fine passages, intermixed with very great faults, for which no excuse can be made. This book contains passages of our four gospels, though it has been doubted whether he used the four, or some one gospel containing in all these. Its author seems to own the first epistle of St. John, and the book of the Revelation. He was also well acquainted with the book of the Acts of the Apostles; but it is not certain how far he owned it. The passages from St. Paul's epistles are not sufficient to prove, that they were esteemed by this writer to be of authority. The author does not seem, indeed, to have any great kindness for the apostle Paul, and on this account he made little use of his epistles, and of the Acts of the Apostles. From his hasty infinuations, and injurious reflections upon St. Paul, it may be suspected that he was a mere Ebionite; the ancients alluring us, that this sect of Christians rejected the authority of that apostle and his epistles. The author bears testimony to many principal facts of the New Testament. He gives an account of our Lord's temptation; he mentions the choice of the 12 apostles, and afterwards of other 72 disciples. In one place he speaks of the 12 apostles in such a manner as if he intended to exclude Paul from the honour of the apostleship, and even to deny him the character of a sufficient and faithful "preacher of Christ's word." We have also, in this book, relations of the miracles of our blessed Lord's ministry, and of his death and resurrection, and the extraordinary signs attending these events. Grabbe's Preface to the Writings of St. Clement in his "Spicilegium." Coteler apud Patr. Auct. tom. i. p. 484. Lardner's Works, vol. ii. p. 342, &c. See Clementin Homilies.

RECOGNITION, in the Drama. See DISCOVERY.

RECOGNIZO, aduallanda per vivum et duritiam factis, in Lexis, is a writ to the judicet of the common bench, for sending a record touching a recognizance, which the recognizor fugglest has to be acknowledged by force and hard dealing; that, if it to appear, it may be annulled. See TRANSCRIPTIO.
along the cylinder, is to the length of the cannon diminished by the space behind the ball, as the weight of the ball is to the weight of the cannon. Let a twenty-four pounder of ten feet be 6400 pounds weight, and when the ball quits the piece, the cannon will have recoiled \( \frac{4}{5} + \frac{1}{5} \times 10 = \frac{1}{5} \) of a foot, less than half an inch.

The greater the charge, *cæteris paribus*, the greater the rebound. By an experiment made before the Royal Society, and related in the Philosophical Transactions, it was found, that cannons, charged to a certain degree, throw the ball from right to left of their own direction; but that the cannons themselves recoil from left to right.

Some of the gentlemen of the French academy doubting the justness of the observation, M. Caffini, the younger, undertook to repeat the experiment; which he did by means of a machine, as like that used in England as he could: and that tried over and over again.

The result was, that the ball, when the gun had liberty to recoil, was always thrown to the right of the point to which it was thrown when the gun was fixed without a possibility of rebounding; but then the recoil was always made the same way, viz. to the right; and he never found that contrariety of directions between the ball and the rebound, observed in the English experiment. See Hilt. Acad. R. Scienc. A. 1703. p. 120, &c.

The cause of the phenomenon seems very difficult to assign; for supposing the guns of a common make, with the touch-hole on the top, we cannot so much as guess what cause should conduce to determine the ball from right to left; unless some very material circumstances be omitted in the report they have given us in the experiment.

Guns whose vents are a little forward in the chase recoil most. To lessen the recoil of a gun, the platforms are generally made sloping towards the embasure of the battery. See Projectiles.

RECOLATION, a method of fining the decoctions of vegetables, &c. by repeated percolation, or straining them several times successively through a linen or woollen bag.

RECOLLECTION, a mode of thinking, by which those ideas, fought after by the mind, are with pain and endeavour found, and brought again to view. See Memory and Imagination.

RECOLLETS, a congregation of reformed Franciscans, called also friers minor of St. Francis, of the strict observance. They were established about the year 1532, when some religious of the order of St. Francis being willing to keep his rule to the letter, Clement VII. gave them houses, whether they might retire, and receive such as were disposed to follow them. The same year he approved the reform; and in 1564, it was carried from Italy into France, where these religious had already been established, in the towns of Tulle in Limousin, and Murat in Auvergne. They had a convent at Paris in 1603; and since they have erected no less than a hundred and fifty in the whole kingdom, where they are divided into seven provinces.

RECOLOGNE, in Geography, a town of France, in the department of the Doubs; eight miles W. of Besançon.

RECOMMENDATI. See Affidavit.

RECOMMENDATION, in a Military Sense, denotes a certificate, flating an individual to be properly qualified for a situation in the army. This certificate must be signed by a field-officer in the regulars, addresed to the commanding officer of the regiment, by whom it is forwarded to the commander-in-chief, who lays the name of the person recommended before the king.

RECOMPOSITION, in Chemistry, the compounding of bodies from their separated parts, or principles, so as to compose the original whole again. This is extremely difficult to effect universally, but in some cases it may be done, and that so perfectly, that the recomposed body shall not be distinguishable by the senses from that which had never been separated by the fire. If the art of chemistry were perfect, we should thus be able, at least in some degree, to recompose all the bodies we divide; but this is far from being the case at present. We can by no means do this in vegetable and animal bodies, where there is a vaelular structure, and therefore we are carefully to distinguish between the regeneration of organised, and that of unorganised bodies.

RECONCILIARI, in our Law Books, &c. A church is said reconciliari, to be reconciled, when it is consecrated afore, after having been polluted or profaned; as by the profefsion of pagans, heretics, &c.

RECONCILIATION, in Church History, See Poenitentes.

RECONNOITRE, in War, implies to view and examine the state of things, in order to make a report of them. The word is French, signifying, literally, to know, recollect.

We say to reconnoitre the coasts, to reconnoitre a port, &c. A body of horse was sent to reconnoitre their camp, the ground, the condition of the roads, rivers, &c.

Parties ordered to reconnoitre, are to observe the country and the enemy; to remark the routes, conveniences, and inconveniences of the first; the position, march, or forces of the second. In either case, they should have an expert geographer, capable of taking plans readily; he should be the bell mounted of the whole, that in case the enemy happen to scatter the escort, he may have his works and ideas.

All parties that go for reconnoitring only, should be but few in number; never more than twelve or twenty men. An officer, be his rank what it will, cannot decline going with to few under his command: the honour is amply made up by the importance of the expedition, frequently of the most interisting consequence, and the proper to recomend the prudence, bravery, and address of any officer that has the fortune to succeed.

It is previously necessary that the officer ordered on this duty should be as well acquainted with the country, the roads, and the diftance of the enemy. His party must consist of men of approved fidelity, part of whom should be dismounted. This detachment must march off in the night. The men must have strict orders neither to smoke tobacco, make a noise, nor speak. The officer must be provided with two guides, who are to be strictly interrogated, but are to remain ignorant of the route you intend to take. A detachment of this kind should be furnished with suficiency for two or three days. The horfes are to be fed every two or three leagues, for it is absolutely necessary that they should be always fresh and fit for duty. The officer will take care never to halt, but at a distance from any road, and also take every precaution to prevent his being surprized, while his horfes are feeding, &c.

RECONNOITRE is also used at sea. To reconnoitre a vessel, a fleet, &c. is to approach near enough to examine the rate and burden of a vessel, &c. the force it may have aboard, what nation it is of, &c.

To reconnoitre a land, or shore, is to observe its situation, in order to find what land it is.

RECORD, Recordium, in Law, an authentic testimony of any thing in writing, contained in rolls of parchment, and preferred in a court of record. See Court, and Custom. Records
Records are said to be "vetustatis & veritatis vox origo." So early as the Conquest we find the "prerogativa memoriae eventorum" reckoned up as one of the chief qualifications of those who were held to be "leges patriae optimae instituti." For it is an established rule to abide by former precedents, where the same points come again in litigation; as well to keep the scale of justice even and steady, and not liable to waver with every new judge's opinion, as also because the law in that case being solemnly declared and determined, what before was uncertain, and perhaps indifferent, is now become a permanent rule, which it is not in the breach of any subsequent judge to alter or vary from, according to his private sentiments; he being sworn to determine not according to his own private judgment, but according to the known law and custom of the land; not delegated to pronounce a new law, but to maintain and expound the old one. Yet this rule admits of exception, where the former determination is most evidently contrary to reason; much more if it be clearly contrary to the divine law. But even in such cases the subsequent judges do not pretend to make a new law, but to vindicate the old one from misrepresentation. For if it be found that the former decision is manifestly absurd or unjust, it is declared, not that such a sentence was "bad law," but that it was "not law," that is, that it is not the established custom of the realm, as has been erroneously determined. An act committed to writing in any of the king's courts, during the term in which it is written, is alterable, being no record; but that term once ended, and the act enrolled, it is a record, and of such credit as admits no alteration, or proof to the contrary.

It is a settled rule and maxim that nothing shall be averred against a record (see Court) nor shall any plea, or even proof, be admitted to the contrary. (Co. Litt. 260.) And if the existence of a record be denied, it shall be tried by nothing but itself; that is, upon bare inspection whether there be any such record or no; else there would be no end of disputes. But if there appears any mistake of the clerk in making up such record, the court will direct him to amend it. Courts of record, or repositories for the public records of the kingdom, were first established by Edward I., our English Jusfrinius, some of which are more ancient than the reign of his father, and those were by him collected.

Lawyers reckon three sorts of records: viz., a judicial record, as attaint, &c.; a ministerial record upon oath, as an office of inquisition found; and a record made by conveyance and content, as a fine, or deed enrolled, and the like.

Record, Affurances by matter of, are such as do not entirely depend on the act or content of the parties themselves; but the fact of a court of record is called in, to substantiate, prove, and be a perpetual testimony of the transfer of property from one man to another; or of its establishment, when already transferred: of this nature are private acts of parliament, the king's grants, fines, and common recoveries.

Record, Court of. See Record, supra, and Court.

Record, Debt of, is a sum of money, which appears to be due by the evidence of a court of record. Thus, when a specific sum is adjudged to be due from the defendant to the plaintiff, on an action or suit at law, this is a contract of the highest nature, being enrolled by the sentence of a court of judicature. Debts upon recognizances, together with statutes merchant, and statutes fleape, &c., if forfeited by non-performance of the condition, are also debts of record; the contract, on which they are founded, being witnessed by the highest kind of evidence, viz. by matter of record.

Records, Imbezzling of. See Imbezzle.

Record, matter, mulct, exer., prisoner upon matter of, see Matter, Muster, Over, and Prisoner, &c.

Record, Trial by, is used only in one particular instance; where a matter of record is tried. The party litigant as a fine, a judgment, or the like; and the opposite party pleads "null and record," that is, there is no such matter of record existing: upon this, if true is tendered and joined in the following form, "and this he or she may be enquired of by the record, and the other doth the like," and hereupon the party pleading the record has a day given him to bring it in, and proclamation is made in court for him "to bring forth his record, or he shall be condemned!" and, on his failure, his antagonist shall have judgment to recover. The trial of this issue is, therefore, merely by the record; for, as Sir Edward Coke observes (1 Inst. 117. 260), a record or enrolment is a monument of so high a nature, and imputed in itself such absolute verity, that if it be pleaded there is no such record, it shall not receive any trial by witnesses, jury, or otherwise, but only by itself. Thus, titles of nobility shall be tried by the king's writ or patent only, which is matter of record. (6 Rep. 53.) Also in case of an alien, whether alien, friend, or enemy, shall be tried by the league or treaty between his sovereign and our's; for every league or treaty is of record. (9 Rep. 31.) And also whether a manor be held in ancient demesne or not, shall be tried by the record of Domesday in the king's exchequer. Blackft. Com. book iii.

Record, among Fowlers. A bird is said to record, when it begins to tune or sing within itself; or to form its notes and diploze its organs for ringsing.

The cock thrush is distinguished from the hen in recording; the first being more loud and frequent in it than the second.

Influences have been known of birds beginning to record when they were not a month old. This first melody does not seem to have the least rudiments of the future song; but as the bird grows older and stronger, one may perceive what the setting is aiming at. A young bird commonly continues to record for ten or eleven months, when he is able to execute every part of his song, which afterwards continues fixed, and is scarcely ever altered. The term record is probably derived from a musical instrument, formerly used in England, called a recorder, which seems to have been a species of flute, and was probably used to teach young birds to pipe tunes. Lord Bacon describes this instrument (in his second Century of Experiments) to have been straight, to have had a lefser and greater bore, both above and below, to have required very little breath from the blower, and to have had what he calls a sipple or ropper.

Recordari facias legatum, in Law, a writ directed to the sheriff to remove a caufe depending in an inferior court, as hundred-court, county-court, court of ancient demesne, &c. to the king's bench, or common pleas, &c.

It is thus called, because it commands the sheriff to make a record of the proceedings either by himself, or others; and then to fend up the cause.

Recordes, Robert, in Biography, an early English physician, of Welsh origin, commenced his education at Oxford about the year 1521; and in 1531 was elected fellow of All-Souls College. Devoting his studies to physic, but where, or under what masters, we are not told, he was created doctor in that faculty at Cambridge in 1545. Both before and after this period he is said to have taught arithmetic at Oxford, and to have excelled all his predecessors.
ors in rendering this branch of knowledge clear and familiar. He is likewise mentioned as remarkably skilful in rhetoric, astronomy, geometry, music, mineralogy, and every part of natural history. He was well acquainted with the Saxon language, and made large collections of historical and other ancient manuscripts. To these various studies he joined that of divinity, and was attached to the principles of the Reformers. But notwithstanding he was justly deemed a prodigy of learning and talents, it does not appear that he met with encouragement at all adequate to his merits; since all that we know further of him is, that he died in the king's bench prison, where he was confined for debt, in the year 1558.

He was author of several works, some of which were several times reprinted, on the following subjects.

"The Ground of Arts, teaching the Work and Practice of Arithmetic, both in whole Numbers and Fractions," 1540. This was dedicated to king Edward VI. "The Whitstone of Wit," a second part of the former. "The Pathway to Knowledge, containing the first Principles of Geometry." "The Castle of Knowledge, containing the Explanation of the Sphere." "The Urinal of Physick," 1547, which was reprinted in London in 1582, 1590, and 1665; and in the last mentioned year, the title of "The Judicial of Urines" was given to it. This book contains a description of urinary vessels with figures. It is a short, but very methodical treatise, full of divisions and subdivisions relative to the different kinds of urines, and the prognostics to be deduced from them. Nevertheless he candidly acknowledges at the beginning, that the judgment to be formed in difeases from the urine is not so certain as some have represented; and indeed the perplexity and variety of opinions concerning this subject are sufficiently apparent from his treatise. His other works were, "Of Anatomy?" "Of Auricular Confession?" "Of the Eucharist?" and "The Image of a true Commonwealth." Aikin's Biog. Memoirs of Medicine.

RECODER, Recodator, a person whom the mayor, or other chief magistrate of any city, or town corporate, having jurisdiction, and a court of record, within their precincts, does associate with him, for his better direction in matters of justice, and proceedings according to law. He is usually a counsellor, or other person, versed and experienced in the law. In some towns, which have their particular affizes within themselves, and no mayor, the recorder is the judge.

The recorder of London is one of the justices of oyer and terminer, and a justice of peace of the quorum, for putting the laws in execution for preserving the peace and government of the city; and being the mouth of the city, he delivers the sentences and judgments of the courts therein, and also certifies and records the city customs, &c. He is chosen by the lord mayor and aldermen, and attends the business of the city, on any warning by the lord mayor, &c.

RECODER, in Majic. See RECORD, supra.

RECORDO & procella mittendis, in Law, is a writ to call a record, together with the whole proceedings in the cause, out of an inferior court into the king's court.

RECOVERY, in a legal sense, an obtaining of any thing by judgment, or trial at law; answering to reverts among the civilians.

There is a true and a feigned recovery.

Recovery, True, is an actual or real recovery of any thing, or of the value of it, by judgment. As if a man sue for any land, or other thing, and have a verdict or judgment for him.

Recovery, Feigned or Common, is a sort of fictio juris, being a certain form or course prescribed by law to be observed for the better affuring of lands and tenements to us; the end and effect of which is, to discontinue and destroy entails, tail, remainders, and reversions, and to bar the tails of them.

Thee common recoveries were invented by the ecclesiastics to chide the statutes of mortmain; and afterwards encouraged by the fines of the courts of law in 12 Edw. IV. in order to put an end to all fettered inheritances, and bar not only entail, tail, but also all remainders and reversions expectant thereon.

A common recovery is so far like a fine (which fee), that it is a suit or action, either actual or fictitious; and in it the lands are recovered against the tenant of the freehold; which recovery, being a supposed adjudication of the right, binds all persons, and vails a free and absolute fee-simple in the receiver.

This recovery is either with a single or double voucher; and sometimes a treble or farther voucher, as the exigency of the case may require.

As a recovery is in the nature of an action at law, not immediately compromised like a fine, but carried through every regular stage of proceeding, its form and method are not easily understood by those who are unacquainted with the course of judicial proceedings. Judge Blackstone has, therefore, stated its nature and progress as clearly and concisely as possible; avoiding, to the utmost of his power, all technical terms and phrases not before interpreted. Of his luminous statement we shall avail ourselves in the sequel of this article.

Let us (says he), in the first place, suppose David Edwards to be tenant of the freehold, and desirous to suffer a common recovery, in order to bar all entail, remainders, and reversions, and to convey the same in fee-simple to Francis Golding. To effect this, Golding is to bring an action against him for the lands; and he accordingly sues out a writ, called a precipe good redatt, because those were its initial or most operative words, when the law proceedings were in Latin. In this writ the demandant, Golding, alleges, that the defendant, Edwards, (here called the tenant) has no legal title to the land; but that he came into possession of it after one Hugh Hunt had turned the demandant out of it. The subsequent proceedings are made up into a record or recovery roll, in which the writ and complaint of the demandant are first recited; whereupon the tenant appears, and calls upon one Jacob Morland, who is supposed, at the original purchase, to have warranted the title to the tenant; and thereupon he prays, that the said Jacob Morland may be ordered to defend the title, which he so warranted. This is called the voucher, vocatio, or calling of Jacob Morland to warranty; and Morland is called the voucher. Upon this, Jacob Morland, the voucher, appears, is impleaded, and defends the title. Whereupon Golding, the demandant, defires leave of the court to per aspir, or confer with the voucher in private; which is (as usual) allowed him. And soon afterwards the demandant, Golding, returns to court; but Morland the voucher disappears, or makes the default. Whereupon judgment is given for the demandant, Golding, now called the recoveror, to recover the lands in question against the tenant, Edwards, who is now the recoveror: and Edwards has judgment to recover of Jacob Morland lands of equal value, in recompense for the lands so warranted by him, and now lost by his default; which is agreeable to the doctrine of warranty. This is called the recompense, or recovery in value. But Jacob Morland having no lands of his own, being usually the cryer of the court
court (who, from being frequently thus vouched, is called the common voucher) it is plain that Edwards has only a nominal recompense for the lands so recovered against him by Golding; which lands are now absolutely vested in the said recoveror by judgment of law, and fein thereof is delivered by the sheriff of the county. So that this collusive recovery operates merely in the nature of a conveyance in fee-simple, from Edwards the tenant in tail, to Golding the purchaser.

The recovery, here described, is with a single voucher only; but sometimes it is with double, treble, or farther voucher, as the exigency of the case may require. And indeed it is now usual always to have a recovery with double voucher at the least; by firft conveying an estate of freehold to any indifferent person, against whom the præcipe is brought; and then he vouches the tenant in tail, who vouches over the common vouchee. For, if a recovery be had immediately against tenant in tail, it bars only such estate in the premises of which he is then actually feised; whereas if the recovery be had against another person, and the tenant in tail be vouched, it bars every latent right and interest which he may have in the lands recovered. If Edwards therefore be tenant of the freehold in possession, and John Barker be tenant in tail in remainder, here Edwards doth firft vouch Barker, and then Barker vouches Jacob Morland the common vouchee; who is always the last person vouched, and always makes default; whereby the demandant, Golding, recovers the land against the tenant Edwards, and Edwards recovers a recompense of equal value against Barker the firft vouchee; who recovers the like against Morland the common vouchee, against whom such ideal recovery in value is always ultimately awarded.

This suppos'd recompense in value is the reason why the issue in tail is held to be barred by a common recovery. For if the recoveror should obtain a recompense in lands from the common vouchee (which there is a possibility in contemplation of law, though a very improbable one, of his doing) these lands would supply the place of those so recovered from him by collusion, and would defend to the issue in tail. This reason will also hold with equal force, as to unfit remainder-men and revivers; to whom the possibility will remain and revert, as a full recompense for the reality, which they were otherwise entitled to: but it will not always hold; and therefore, as Pigott says, the judges have been even æquiti, in inventing other reasons to maintain the authority of recoveries. And, in particular, it hath been said, that, though the estate-tail is gone from the recovery, yet it is not destroyed, but only transferred; and still subsists, and will ever continue to subsist (by construction of law) in the recoveror, his heirs, and assigns: and, as the estate-tail so continues to subsist for ever, the remainders or revivers expectant on the determination of such estate-tail can never take place.

To such awkward shifts, such subtle refinements, and such strange reasoning, were our ancestors obliged to have recourse, in order to get the better of that stubborn statute de donis. The design, for which these contrivances were first on foot, was certainly laudable; the univeting the fetteres of estates-tail, which were attended with a legion of mischiefers to the commonswealth; but, while we applaud the end, we cannot but admire the means. Our modern courts of justice have indeed adopted a more manly way of treating the subject; by considering common recoveries in no other light, than as the formal mode of conveyance, by which tenant in tail is enabled to alienate his lands. But, since the ill consequences of fettered inheritances are now generally feared, and of course the utility and experience of setting them at liberty are apparent; it hath often been wished, that the proceeds of this conveyance was shortened, and rendered less subject to niceties, by either totally repealing the statute de donis; which perhaps by reviving the old doctrine of conditional fees, might give birth to many litigations; or by vesting in every tenant in tail of full age the same absolute fee-simple at once, which now he may obtain whenever he pleases, by the collusive fiction of a common recovery; though this might possibly bear hard upon those in remainder or revivers, by abridging the chances they would otherwise frequently have, as no recovery can be suffered in the intervals between term and term, which sometimes continue for near five months together: or, lastly, by empowering the tenant in tail to bar the estate-tail by a solemn deed, to be made in term time and enrolled in some court of record; which is liable to neither of the other objections, and is warranted not only by the usage of our American colonies, and the decisions of our own courts of justice, which allow a tenant in tail (without fine or recovery) to appoint his estate to any charitable use, but also by the precedents of the statute 51 Jac. I. c. 19, which, in case of a bankrupt tenant in tail, empowers his commissioners to sell the estate at any time, by deed indented and enrolled. And if, in so national a concern, the emoluments of the officers, concerned in palling recoveries, are thought to be worthy attention, those might be provided for in the fees to be paid upon each enrolment.

The force and effect of common recoveries may appear, from what has been said, to be an absolute bar not only of all estates-tail, but of remainders and revivers expectant on the determination of such estates. So that a tenant in tail may, by this method of assurance, convey the lands held in tail to the recoveror, his heirs and assigns, absolutely free and discharged of all conditions and limitations in tail, and of all remainders and revivers. But, by statute 34 and 35 Hen. VIII. c. 20. no recovery had again tenant in tail, of the king's gift, whereof the remainder or reviver is in the king, shall bar such estate-tail, or the remainder or reviver of the crown. And by the statute 11 Hen. VII. c. 20. no woman, after her husband's death, shall suffer a recovery of lands settled on her by her husband, or settled on her husband and her by any of his ancestors, and by statute 14 Eliz. c. 8. no tenant for life, of any fort, can suffer a recovery, so as to bind them in remainder or reviver. For which reason, if there be tenant for life, with remainder in tail, and other remainders over, and the tenant for life, is desirous to suffer a valid recovery; either he, or the tenant to the præcipe by him made, must vouch the remainder-man in tail, otherwise the recovery is void; but if he does vouch such remainder-man, and he appears and vouches the common vouchee, it is then good; for if a man be vouched and appears, and suffers the recovery to be had against the tenant to the præcipe, it is as effectual to bar the estate-tail as if he himself were the recoveror. Salk. 571.

In all recoveries it is necessary that the recoveror, or tenant to the præcipe, as he is usually called, be actually feised of the freehold, else the recovery is void. (Pigott, 28.) For all actions to recover the fein of lands, must be brought against the actual tenant of the freehold, else the suit will lose its effect; since the freehold cannot be recovered of him who has it not. And, though these recoveries are in themselves fabulous and fictitious, yet it is necessary that there be altera fabula, properly qualified. But the nicety thought by some modern practitioners to be requisite in conveying the legal freehold, in order to
to make a good tenant to the praecipe, is removed by the provisions of the statute 14 Geo. II. c. 20, which enacts, with a retrospect and conformity to the ancient rule of law, that, though the legal frehold be vested in lieges, yet those who are entitled to the next frehold estate in remainder or reversion may make a good tenant to the praecipe, that, though the deed or fine which creates such tenant be subsequent to the judgment of recovery, yet, if it be in the same term, the recovery shall be valid in law; —and that, though the recovery itself do not appear to be entered, or be not regularly entered, on record, yet the deed to make a tenant to the praecipe, and declare the uses of the recovery, shall after a postrion of twenty years be sufficient evidence, on behalf of a purchaser for valuable consideration, that such recovery was duly suffered. And this may suffice to give the student a general idea of common recoveries, the last species of assurances by matter of record.

For an account of deeds to lead, or declare, the uses of fines, and recoveries; see Uses.

In some manors, by special custom, recoveries may be suffered of copyhold (Moor, 637;) but as these differ in nothing material from recoveries of free land, excepting only that they are not suffered in the king's courts, but in the court baron of the manor, we shall refer this subject to the article SURRENDER. In this place we shall observe, however, that a fine or recovery had of copyhold lands in the king's court may, if not duly reversed, alter the tenure of the lands, and convert them into frank-fee, which is defined in the old book of tenures to be "land payable at the common law;" but upon an action on the case, in the nature of a writ of "deceit," brought by the lord in the king's court, such fine or recovery will be reversed, the lord will recover his jurisdiction, and the lands will be restored to their former state of copyhold. Black. Com. b. ii.

Clerk of Inrollments of Recoveries and Fines. See Clerk.

Recovery, Fort, in Geography, a fort of America, in the Indiana territory, situated on a branch of the Wabash river, about 25 miles from Greenville. It consists of two block-houses, and barracks with curtains, sufficient for 60 men.

Recontre, French; formed of re, and couper, to cut again, in Law, to rebate, or discont.

Thus, if a man have ten pounds illuing out of certain lands, and he deteiles the tenant of the land; in an affidavit brought by the defier, if he recover the land and damages, the defier shall recover the rent due in the damages.

Recontre also denotes a quick, sharp reply, to a peremptory demand. See Repartee.

Recreant, in our old Law-Books, implies cowardly, faint-hearted.

Hence recreant. See DRAVEN and CHAMPION.

Re created was in reproachfull a word, that Granville would not describe it. Recreated equi, is used by Plut. lib. ii. cap. 2. for dull, jaded horses.

RECREATION ISLAND, in Geography, a fertile island in the Southern Pacific ocean, discovered by Roggevin in the year 1722. Some of the ship's company obtained a quantity of antiscorbutic herbs; but upon venturing into the country, they were assailed by the natives, who, by cutting fomes at them, killed four, and wounded almost all. Many of the islanders were killed by the fire-arms in return. The soil produces sugar-canes, cocoa-nuts, pomegranates, Indian figs, &c. The inhabitants were well made, robust, and very lively; their bodies were painted, and they were armed. S. lat. 16°. W. long. 148°.

Recrement, in Medicine, some superfluous matter separated from some other that is useful.

In which sense, it amounts to much the same with facces, or excrement.

Recrements of vegetables are useful as manure.

Recrement is sometimes also used to denote such secreted juices in the body, as are afterwards of use in the economy; as the lymph, gall, &c. which are thus called, in contradistinction to excrement, which are expelled out of the body, as of no further use.

Recrimination, a posterior accuasation brought by the accused against his accuser, upon the fame fact.

When two parties have made their mutual complaint at the same time; the business is, first, to determine who shall be the accuser, and who the accused, i.e. on whom shall fall the recrimination.

By the French laws, recrimination is of no force till the criminal hath been purged legally.

Recrevuscence, Recrudescencia, in Medicine, is a relapse, when a disease that has gone off returns again.

Recruits, in the Military Art, new men raised to supply the places of such as have loft their lives in the service, or are rendered unserviceable by age or wounds. See Listing.

Recruit-Horses, are the horses brought up for completing the regiments of horse or dragoons every year.

Rectangle, in Geometry, called also oblong, and long square, a quadrilateral rectangual figure M L I K, (Plate XII. Geometry, fig. 3.) whole opposite fides, M L and I K, as well as M I and L K, are equal.

Or, a rectangle is a parallelogram, whose sides are unequal, but its angles right.

To find the area of a rectangle, see PARALLELOGRAM.

If from the same point A, (fig. 4.) be drawn two lines, one of which, A D, is a tangent to a circle, the other a fectant A B; the squire of the tangent A D will be equal to the rectangle under the fectant A B, and that part of it without the circle A C. If two or more fectants, A a, A B, &c. be drawn from the same point A; the rectangles, under their wholes, and their parts without the circle, will be equal. If two chords intersect each other, the rectangles under their segments will be equal. The rectangles under equal lines are equal. The sum of all the rectangles contained under a given line, and all the parts of another any how divided, is equal to the rectangle contained under the two whole lines. If from any point, within a rectangle, to the angles of a rectangle, four lines be drawn, the sums of the squares of those drawn to the opposite angles will be equal. The rectangles contained under the corresponding fides of equiangular triangles, taken alternately, are equal. The rectangle under the two fides of any triangle is equal to the rectangle under the perpendicular to its base, and the diameter of the circumference of the circle. The squire of a line bisecting any angle of a triangle, and terminating in the opposite side, together with the rectangle under the two segments of that side, is equal to the rectangle of the two fides, including the proposed angle. The rectangle of the two diagonals of any quadrilateral inscribed in a circle, is equal to the sum of the two rectangles contained under the opposite sides.

Rectangles, Similar. See SIMILAR.

Rectangle, in Arithmetic, is the same with product or factum.

Rectangled, Right-angled, Triangle, is a triangle, one of whose angles is right, or equal to 90°. See Triangle.
There can be but one right angle in a plain triangle; therefore a rectangled triangle cannot be equilateral.

RECTANGULAR, in Geometry, is applied to figures and folids which have one or more angles right.

Such are squares, rectangles, and rectangled triangles, among plain figures; cubes, parallelepipeds, &c, among folids.

Solids are also said to be rectangled with respect to their situation: thus, if a cone, cylinder, &c, be perpendicular to the plane of the horizon, it is called a rectangled or right cone, cylinder, &c.

The ancient used the phrase rectangled section of a cone, to denote a parabola; that conic section, before Apollonius, being only considered in a cone, whole section by the axis would be a triangle, right-angled at the vertex. See Conic Sections.

Hence it was that Archimedes entitled his book of the quadrature of the parabola, by the name of "Rectanguli Coni Secatio."

RECTANGULAR Barometer. See Barometer.

RECTANGULAR Windsmills. See Windsmills.

RECTIFICATION, compounded of rectus, right, direct, and fac, I became, the act of rectifying, i.e. of correcting, remedying, or redressing, some defect or error, in respect either of nature, art, or morality.

Rectification, in Chemistry, is the repeating of a distillation or sublimation several times, and generally with a less degree of heat than at first, in order to render the substance purer, finer, and freer from aqueous and earthy parts.

Rectification is a reiterated deputation of a distilled matter, e.g. brandy, spirits, or oils, by distilling them over again, to render them more subtils, and exalt their virtues.

That the rectification of spirits may, in all cases, proceed with the greatest exactness, a due regard to it must be had even from the first fermenting the substance from which they are to be made, and continued through all the stages of distillation, the low wines, proof spirit, and alcohol. The management of the fermented liquor, to this purpose, is principally the letting it stand to subside after the fermentation is over, and the drawing it off clear and thin, not too rich for the still. The still is not to be overfulled with this.

Great care must be taken to prevent its burning, and the fains that run last must be kept separate, not mixed with the rest of the liquor distilled, which is now called the low wines. In the rectifying of these into proof spirit, great caution must be used that the fire be kept regular, not raised by fudden spirits, which always throw up the oil in large quantities, which is to be left behind. In the succeeding rectification of the proof spirit into alcohol, the fire cautious management of the fire is necessary; and, in both this and the last, the fains are not to be suffered to run in among the spirit, but to be faved separate. They may be all mixed together at last, and reduced to a spirit fit for burning in lamps; but the keeping out of the rectified liquor will keep away the coaled and most flinking part of the oil of the ingredients.

By these easy means, without any additional trouble or charge, we might be furnished with a spirit greatly exceeding what we commonly meet with. And in general, the art and mystery of our fellers of the severall sorts of English brandies, seem to consist in this prudent management, and in the adding a little of the oleum vini, or oil of wine-leas, to the spirits thus procured pure; this gives the flavour of foreign brandies, and is so extensive in its use, that half an ounce of it is sufficient for a hoghead of pure spirit.

Malt spirit is that which principally requires all this care, in the rectification, because its oil is more nauseous and offensive than that of any other spirit; but all others will be greatly the better for being treated in the same manner, and it is indeed necessary that they should for some particular uses.

It is remarkable, that no one method of combinatory rectification, that is, of the rectification performed by means of salt, and other additions, is suited to all the several kinds of spirits; scarcely indeed will any one way serve for any two spirits: but this method, by simple and careful distillation, is equally suited to all. Molasses-spirit, cider-spirit, wine-spirit, or brandy, run, and arrack, are all improved by it; and all of them are then known to be perfectly rectified, when, in the state of alcohol, they not only prove, totally inflammable in a little vesel floating upon cold waters, but when poured into the purest spring water they have not the least power of making any change in it, nor leave any marks of oiliness, or that unctuosity which, on the mixture of the leas pure spirits, float on the top, and in certain lights gives the rainbow colours. See Shaw's Essay on Distillation. See Alcohol and Distillation.

Fixed salts are rectified by calcination, distillation, or filtration.

Metals are rectified, i.e. refined, by the coppel; and regu- lapse by repeated fusions, &c.

In a word, all rectifications are founded upon the same principle; and consist in separating substances more volatile from substances less volatile; and the general method of effecting this is to apply only the degree of heat which is necessary to cause this separation.

RECTIFICATION of vitriolic Acid. See Concentration.

Rectification, in Geometry, is the finding of a right line equal to a proposed curve, or simply finding the length of a curve line; a problem which, even in the present advanced state of analysis, is attended in many cases with considerable difficulty; and was, in all, totally beyond the reach of the ancient geometers, who were not able to allign the length of any curve line whatever; though they could, in a few instances, determine the area of a curvilinear space. See Quadrature.

The first rectification of a curve line was effected by Mr. H. Neal, as we are informed by Dr. Wallis, at the conclusion of his Treatise on the Cylind. This curve was the semicubical parabola, and Neal's rectification of it was published in July or August, 1657; and two years after, viz. in 1659, the fame was done by Van Haureat in Holland. See Schooten's Commentary on Descartes' Geometry.

It is, however, to the doctrine of fluxions that we owe the complete rectification of curve lines, in finite terms, when they admit of it; and in others by means of infinite series, circular arcs, logarithms, &c; of which method we shall give a general view in the present article.

Let A M O (Plate XIII. Analysis, fig. 10.) be a curve of any kind, whose ordinates are parallel to one another, and perpendicular to the axis A H; and let the fluxion of the abscissa A P be denoted by P p or M R, and R m be taken to represent the corresponding fluxion of the ordinate P M, then will the tangent M m be the line which the generating point of the curve would describe, if its motion were to become uniform at M; consequently this line will truly express the fluxion of the space A M. Hence putting P A = x, P M = y, and A M = z, we have z = M m = \sqrt{(M R\text{'} + R m)} = \sqrt{(x^2 + y^2)}; from which, and the equation of the curve, the value of y may be determined. But if all the ordinates of the proposed curve A R M (fig.) be referred to a centre C; then, putting the tangent R P, intercepted by the perpendicular C P, = i, the arc B N of a circle described about the centre C, = x, the radius...
RECTIFICATION.

radius CN (or CB) = a, &c. (see Quadrature of Curves, Café 2.) we shall have \( z : y : y (CR) : t (RP) \);
and consequently, \( z = \frac{y^2}{t} \); whence the value of \( z \) will be found, if the relation of \( y \) and \( t \) is given.

I. To find the length of the semi-cubical parabola, of which the equation is \( ax^3 = y^3 \), or \( x = \frac{y^2}{a^2} \).

Here \( x = \frac{3y^2}{a^2} \) or \( x^2 = \frac{9y^2}{4a^2} \); substituting, therefore, this value of \( x^2 \) in the general expression
\( z = \sqrt{y^2 + x^2} \), we have
\( z = \sqrt{\left(\frac{9y^2}{4a^2} + y^2\right)} = \frac{\sqrt{y^2}}{2a^2} \sqrt{(y + 4a)} \); the fluent of which is
\( z = \frac{1}{27a^2} \times (y + 4a)^{3/2} + C \), correction.

Now when the arc = 0, then \( y = 0 \); therefore
\( 4a^2 + C = 0 \), or \( C = -\frac{4a^2}{27a} \);
whence the complete fluent is
\( z = \frac{(y + 4a)^{3/2} - 4a^2}{27a} \),
which is the length of the curve, answering to any length of the ordinate \( y \).

II. To rectify the common parabola; or to find the length of any parabolic arc AM (fig. 11.) Let the parameter = \( a \), the absciss \( = AP = x \), &c. as above. From the well known property of this curve, \( ax = y^2 \); and \( a \times = 2y/2 \); consequently \( x = 2y/a \), and \( x^2 = \frac{4y^2}{a^2} \), which substituted for \( x^2 \) in the general expression for the length of the curve, makes \( z = \left(\frac{4y^2}{a^2} + y^2\right)^{3/2} = \frac{y^2}{a} \times (a^2 + 4y^2)^{3/2} \);
which, thrown into an infinite series, becomes
\( \left(\frac{2y^2}{a} - \frac{2y^2}{a^2} + \frac{4y^6}{a^4} \right) \), i.e., \( z = \frac{2y^2}{a} \times \frac{4y^6}{a^4} \), &c.

The fluent of this series is \( z = y + \frac{2y^4}{3a^2} - \frac{2y^2}{5a^2} + \frac{4y^6}{7a^2} \), &c., = the length of the curve AM required.

Otherwise: the above \( z = \frac{y}{a} \times (a^2 + 4y^2)^{3/2} = \frac{1}{a} \times (a^2 + 4y^2)^{3/2} \), &c. But the fluent of the first of these
two terms is \( \frac{3y^2}{2a} \times (a^2 + 4y^2)^{3/2} = \frac{y}{a} \times (\frac{3}{4} a^2 + y^2) \);
and the fluent of the last of the two terms is \( \frac{1}{2} a \times (\frac{3}{4} a^2 + y^2)^{3/2} \); therefore
\( z = \frac{y}{a} \times (\frac{3}{4} a^2 + y^2)^{3/2} + \frac{3y}{2a} \times \sqrt{(\frac{3}{4} a^2 + y^2)} \).

Hence, if \( AC \) and \( DC \) (fig. 12.) be the conjugate foci-axes of an equilateral hyperbola; and \( AC = a \), \( MP = 2y, QM = x \), then will \( AP = x - a \); and \( x^2 - a^2 = 4y^2 \); therefore \( x^2 = 4y^2 + a^2 \); consequently \( x = \sqrt{4y^2 + a^2} \). If then \( q \) be supposed infinitely near \( QM \), we shall have \( \sqrt{Qq} = s \), and therefore the element of the area \( CQMA = \frac{y}{a} \times \sqrt{(a^2 + 4y^2)} \). Whence it appears, that the rectification of the parabola depends on the quadrature of the hyperbolic space \( CQMA \).

III. To determine the length of an arc of the common hyperbola. Let the rectilinear axis be represented by \( b \), and the foci-conjugate by \( c \), and we shall have \( \frac{b^2 y^2}{c^2} = 2b x + x^2 \), from the nature of the curve (see Hyperbola); and therefore \( x = \frac{b y y}{c \sqrt{(c^2 + y^2)}} - b \); hence \( \dot{x} = \frac{b y y}{c \sqrt{(c^2 + y^2)}} \), and \( \ddot{x} = \sqrt{(y^2 + x^2)} = \sqrt{\left(\frac{b y y}{c \sqrt{(c^2 + y^2)}}\right) + \frac{b^2 y^2}{c^2 \sqrt{(c^2 + c^2 y^2)}}} \); which, by converting \( \frac{b^2 y^2}{c^2 \sqrt{(c^2 + c^2 y^2)}} \) into an infinite series, becomes \( \ddot{x} = \left(1 + \frac{b^2 y^2}{c^2 \sqrt{(c^2 + c^2 y^2)}} - \frac{b^2 y^2}{c^5} \right) \); &c. But still we have the square root to extract: in order to which, let it be assumed \( = 1 + A y^2 + B y^4 + C y^6 + D y^8 \), &c. Then, by squaring, and transposing, there arises
\( 1 + 2 A y^2 + 2 B y^4 + 2 C y^6 + 2 D y^8 \), &c.
\( + A^2 y^4 + 2 A B y^6 + 2 A C y^8 \), &c.
\( + B^2 y^8 \), &c.
\( - 1 - \frac{b^2}{c^2} \times y^2 - \frac{b^2}{c^4} \times y^4 - \frac{b^2}{c^6} \times y^6 - \frac{b^2}{c^8} \times y^8 \), &c.
Hence \( A = \frac{b^2}{2c^2} \); \( B = -\frac{b^2}{c^4} \); \( -\frac{1}{2} A^2 = -\frac{b^2}{2c^4} \); \( C = \frac{b^2}{2c^2} - A B = -\frac{b^2}{2c^4} \); \( -\frac{b^2}{4c^4} + \frac{b^4}{16c^8} \), &c. &c. Therefore \( \ddot{x} = \sqrt{\left(1 + \frac{b^2 y^2}{c^2 \sqrt{(c^2 + c^2 y^2)}} - \frac{b^2 y^2}{c^5} \right) \times \frac{b^2 y}{c^4} \times y^2 + \frac{b^2}{c^8} \times y^4 \), &c. \)

\( = \ddot{x} + \frac{b^2}{2c^4} \times y^2 y^2 - \left(\frac{b^2}{2c^4} + \frac{b^2}{16c^8}\right) \times y^4 y^2 + \left(\frac{b^2}{2c^4} + \frac{b^2}{8c^8}\right) \times y^6 y^2 + \left(\frac{b^2}{2c^4} + \frac{b^2}{8c^8}\right) \times y^8 y^2 + \ldots \)


\[ \frac{b^2}{c^2} \left( \frac{1}{2} \right) \times y^3, \text{ &c.} \]

and consequently \( z = y + \frac{b^2}{c^2} \left( \frac{1}{2} \right) \times y^3, \text{ &c.} \)

By the very same way of proceeding, the arc of an ellipsis may be found, the equations of the two curves differing in nothing but their signs.

IV. To rectify the spiral of Archimedes. The value of \( t \) (A T, f. 15.) being denoted by \( \frac{b}{\sqrt{b^2 + y^3}} \) (see Tangent of the Spiral, &c.), we have

\[ \frac{d}{d} \left( b^2 + y^3 \right) \frac{d}{d} \left( b^2 + y^3 \right) \]

which fluxion being the same as expressing the arc of the common parabola (Prob. II.), by inserting in the expression

\[ \frac{d}{d} \left( b^2 + y^3 \right) \frac{d}{d} \left( b^2 + y^3 \right) \]

fluent will, therefore, be truly represented by the measure of the said arc, or by \( \frac{1}{2} \left( b^2 + y^3 \right) \). The value there found, by making the proposed substitution,

\[ y + \frac{1}{2} \left( b^2 + y^3 \right) \]

the value, there found, by making the proposed substitution.

V. To rectify the involute of a circle, whose nature is such, that the part \( P R \) (fig. 14.) of the tangent intercepted by the point of contact and the perpendicular \( CP \), is every where equal to the radius \( CO \) of the generating circle.

In this case \( \frac{d}{d} \left( \frac{y}{x} \right) = \frac{y}{a} \), which, corrected by making \( y = a = A C \), becomes

\[ \frac{y^3 - a^2}{2a} \left( \frac{C P}{2A C} \right) \]

the true measure of the required arc \( A R \).

VI. To find the length of a circular arc. This may be expressed either in terms of the sine, cosine, versed sine, or any other trigonometrical line, as follows.

Let the versed sine - - of the circle - - radius - - and arc = - - then, by the property of the circle, \( y^2 = 2r x - x^2 \) or, putting tangent = \( t \) and tangent = \( s \), we have

\[ y^2 = \frac{r^2 t^2}{r^2 + s^2} \]

as are readily deduced from the known properties of the circle.

Now, by means of these values of \( y^2 \), or of \( 2r x - x^2 \), and the general equation \( \ddot{z} = \sqrt{(x^2 + \ddot{y})} \), we readily draw the following values of \( \ddot{z} \), viz.

\[ \ddot{z} = \begin{cases} \sqrt{2r x - x^2} = \frac{r \ddot{x}}{r^2 + t^2} \\ \sqrt{(x^2 + \ddot{y})} = \frac{r \ddot{t}}{r^2 + s^2} \\ \sqrt{(x^2 + \ddot{y})} = \sqrt{(x^2 + \ddot{y})} \\ \sqrt{(x^2 + \ddot{y})} = \sqrt{(x^2 + \ddot{y})} \end{cases} \]

the fluents of which can only be found in series, which are as follows; making radius \( r = 1 \), viz.

Having
Having thus laid down his plan of operation, by a few trials he fell upon a number well suited to his purpose, viz., knowing the tangent of $\frac{1}{4}$ of $45^\circ$, or $11^\circ\ 15'$, to be very nearly $\frac{1}{5}$, radius being 1, he assumed for his first arc that whose tangent is $\frac{1}{5}$; then since $\tan\ 2\ a = \frac{2\ \tan\ a}{1 - \tan^2\ a}$,

he had $\frac{5}{12}$ for the tangent of his double arc, and $\frac{120}{119}$ for the double of this, or of four times the first, which being a little greater than $45^\circ$, was well adapted to his views; for by a known trigonometrical property, $\tan\ (a - 45) = \frac{\tan\ a - 1}{\tan\ a + 1}$; that is, the tangent of the small arc, which is equal to the excess of its multiple above $45^\circ$, was $\frac{120}{119} - 1 = \frac{1}{239}$.

He had, therefore, two arcs to compute, the one having for its tangent $\frac{1}{5}$, and the other $\frac{1}{239}$; and then four times the first of these arcs minus the latter, would evidently give the exact arc of $45^\circ$, and both these numbers being such as to converge very well in the general series, the difficulty attending the usual approximation was avoided. Other approximations, however, have since been discovered, which, if not more rapid, their investigation is, at least, more simple, of which, perhaps, that of Euler's is the most deserving of notice. This celebrated geomter observes, that every arc whose tangent is commensurable with the radius, as, for instance, $45^\circ$, may be divided into two arcs, of which the tangents, though much smaller, are still commensurable with the radius; for since

$$\tan\ (a + b) = \tan\ a + \tan\ b,$$

we have also

$$\tan\ a = \tan\ (a + b) - \tan\ a \\tan\ b,$$

where it is obvious that if $\tan\ (a + b)$ and $b$ be rational, $\tan\ a$ will also be rational; thus, if $\tan\ (a + b) = \tan\ 45^\circ = 1$, and $\tan\ b = \frac{1}{2}$, we have $\tan\ a = \frac{1}{3}$, and we shall evidently have a similar result, whatever rational fraction we assume for $\tan\ b$.

We shall find, therefore, by the series which gives the arc in terms of the tangent, each of these arcs, the sum of which will evidently be the measure of the whole arc sought; whether the arcs themselves, which belong to these tangents, be rational or irrational, with respect to the whole arc of which they form the parts. These tangents, substituted in the general series above, give arc to tan. $\left(\frac{1}{2}\right)$ =

$$\frac{1}{2} - \frac{1}{3\cdot2^1} + \frac{1}{5\cdot2^3} - \frac{1}{7\cdot2^5} + \frac{1}{9\cdot2^7} - &c.$$

and arc to tan. $\left(\frac{1}{3}\right)$ =

$$\frac{1}{3} - \frac{1}{3\cdot3^1} + \frac{1}{5\cdot3^3} - \frac{1}{7\cdot3^5} + \frac{1}{9\cdot3^7} - &c.$$

In both which series, the terms diminish much more rapidly than in the original series, and may therefore be computed with tolerable ease.

But it is evident that we may proceed farther in this approximation, by dividing each of these into other two arcs, by which means the convergency will obviously be much more rapid; and though, generally speaking, for every subdivision we double the number of our series, yet the degree of convergency is so much the greater as amply to compensate for the additional number of series. Besides, we may always subdivide our greater arc, so that one of its subdivisions shall be the same as the smaller arc, in which case we do not increase the number of series. Thus; arc to tan. $\frac{1}{2} = \frac{1}{2}\ tan.\ \frac{1}{3} +\ arc\ to\ tan.\ \frac{1}{7}$; therefore arc to tan. $1 = 2$ arc to tan. $\frac{1}{3} +\ arc\ to\ tan.\ \frac{1}{7}$. Again; arc to tan. $\frac{1}{3} =\ arc\ to\ tan.\ \frac{1}{7} + 2\ arc\ to\ tan.\ \frac{1}{11}$; and so on to any extent required, which might in course be published so far as to render the operation as simple and as little laborious as can be expected in such kind of computations. Even with these already mentioned, the circumference of the circle might undoubtedly be computed to 200 places of decimals, with less labour than it cost Vieta to carry them to 10 places, or Romanus to 15.

The reader will observe, that this approximation differs from Machin's in nothing except the simplicity and generality of the investigation; for if we make the successive subdivision of the greater arc, so as always to include in it the smaller one, we shall find in our results the identical formula of Machin.

Let us repeat our former expression

$$\tan\ a = \tan\ (a + b) - \tan\ b,$$

Let $\tan\ (a + b) = \frac{R}{T}$, $\tan\ a = \frac{R'}{T'}$, $\tan\ b = \frac{r}{I}$ and we shall have generally $\frac{R'}{T'} = \frac{R + T'}{T'}$.

Let now $\tan\ (a + b) = 1$, answering to arc $45^\circ$, so that $R = 1$, and $T = 1$; assume also $r = 1$, then, by constantly subtituting, in the general expression, the values found for $R'$, $R''$, $R'''$, &c. and $T'$, $T''$, $T'''$, &c. for $R$ and $T$ respectively, we shall have

$$R' = \frac{t - 1}{t + 1},$$

$$T' = \frac{t^2 - 2t - 1}{t^2 + 2t - 1},$$

$$R'' = \frac{t^4 - 3t^2 - 3t + 1}{t^4 + 3t^2 - 3t - 1},$$

$$T'' = \frac{t^8 + 3t^4 - 3t - 1}{t^8 - 3t^4 - 3t + 1},$$

$$R''' = \frac{t^8 - 4t^6 + 6t^4 + 4t + 1}{t^8 + 4t^6 - 6t^4 + 4t + 1},$$

$$T''' = \frac{t^{16} - 5t^{12} - 10t^{10} + 10t^8 + 5t - 1}{t^{16} + 5t^{12} - 10t^{10} - 10t^8 + 5t + 1}.$$
$$\frac{R^{(n)}}{T^{(n)}} = \frac{t^n - n t^{n-1} + \frac{n (n - 1)}{1 \cdot 2} t^{n-2} + \&c.}{t^n + n t^{n-1} - \frac{n (n - 1)}{1 \cdot 2} t^{n-2} - \&c.}$$

So that, generally, arc to tan. $1 = n \times \arc \tan \frac{1}{t}$ + arc to tan. $R^{(n)}$.

If we take $n = 1$, and $t = 3$, we have arc $t = 1$ = arc tan. $\frac{1}{3} + \text{arc tan.} \frac{1}{2}$. If $n = 2$, and $t = 3$,

we have arc tan. $2 = 2 \times \text{arc tan.} \frac{1}{3} + \text{arc tan.} \frac{1}{7}$. If $n = 4$, and $t = 5$, we have arc tan. $4 = 4 \times \text{arc tan.} \frac{1}{5}$.

arc tan. $\frac{1}{239}$; which is the formula of Machin, and by giving other values to $n$ and $t$, a variety of other formulae might be found, though it would, probably, be difficult to find one more convergent than the last. The reader will examine this on more at length in Dr. Hutton’s Tracts.

We shall conclude this article by giving the circumference of the circle to 15 places, as given by Zach, from a manuscript, which he has in the Ratcliff library at Oxford, differing from the periods of the several approximations of different authors mentioned in the preceding part of this article, and the article Quadrature.

The diameter of a circle being 1, the circumference will be a b c d
e 3.14159 0.6535 2.05893 2.3846
f 2.6433 0.3279 0.50288 4.1971
h 0.69399 3.7510 5.8209 7.4944
i 0.9230 7.1646 0.6286 2.0899
j 8.6280 3.4825 3.4511 7.0679
g 8.2148 0.6651 3.2243 0.6647
h 0.6938 4.6905 5.0829 2.3172
i 0.5359 0.8128 4.802.

a, Archimedes; b, Metius; c, Vieta; d, Adrianus Romanus; e, Van Ceulen; f, Abraham Sharp; g, Machin; h, Lagney; i, Oxford Manuscript.

* This figure is a 7 in Lagney’s approximation, but Vega, in the revision of the computation, alters that it ought to be an 8, as we have given it.

RECTIFIED Spirits, &c. are such as have undergone the operation of rectification, or have been distilled over and over, to separate from them any heterogeneous matter, which might have arisen with them in the former distillations.

Hence we say, spirit of wine twice rectified, thrice rectified, &c.

It is the rectification that makes the difference between brandy and rectified spirits of wine. See Spirits.

RECTIFIER, in Navigation, is an instrument used for determining the variation of the compass, in order to rectify the ship’s course, &c.

It consists of two circles, either laid upon, or let into one another, and so fastened together in their centres, that they represent two compases, the one fixed, the other moveable; each is divided into thirty-two points of the compasses, and three hundred and sixty degrees, and numbered both ways, from the north and the south, ending at the east and west in ninety degrees.

The fixed compass represents the horizon, in which the north, and all the other points, are liable to variation.

In the centre of the moveable compass is fastened a silk thread, long enough to reach the outside of the fixed compasses; but if the instrument be made of wood, an index is used instead of the thread.

RECTIFIER, in the Distillery, the person whose employment is to take the coarse malt-spirit of the malt-tillers, and re-distill it to a finer and better liquor. The art of the rectifier might be entirely lost aside, if the malt-tillers could make their spirit perfect at the second operation; which seems very practicable, if the malt-tillers could be induced to forsake their old practice. The great things to be recommended for the improvement of their art, would be, first, the brewing in liquid; and secondly, the keeping of their wash after the manner of flake beer, till it has entirely lost its malt flavour, and acquired a pungent acid vinosity; and then, thirdly, leaving out the lees, to distil with a well-regulated fire. It is scarcely to be thought how pure a spirit is to be obtained from malt this way; but the great art would be, the finding of a method to make malt liquors artificially flake, bright, and flavourful, though otherwise vineous.

Shaw's Lectures, p. 223.

RECTIFYING Curves. See Rectification.

RECTIFYING of the Globe or Spheres, is a previous adjusting of the globe or sphere, to prepare it for the solution of problems. For the method of doing it, see Use of the Celestial Globe.

RECTILINEAR, Right-lined, in Geometry, is applied to figures whose perimeter consists of right lines.

RECTILINEAR Angle, Map, and Superficies. See the sub-

RECTITUDE, Rectitude, Rectum, in matters of philosophy, refers either to the act of judging, or of willing; and therefore, whatever comes under the denomination of rectitude is either what is true, or what is good: these being the objects about which the mind exercises its two faculties of judging and willing.

Rectitude of the mind, considered as it judges, i.e. rectitude of the faculty of judgment, consits in its agreement and conformity to the nature and reason of things, and in its determining and deciding about them according to what their constitutions, properties, uses, &c. really are.

Rectitude of the mind, considered as it wills, called also moral rectitude, or uprightness, consists in the choosing and pursing of those things which the mind, upon due enquiry and attention, clearly perceives to be good; and avoiding those that are evil.

RECTITUDINES, in Law, rights, or legal dues, belonging either to God, or man. See Right.

RECTO, a writ usually called a writ of right; of so high a nature, that whereas other writs in real action are only to recover the possession of the lands, &c. in question, loft by the plaintiff, or his ancestor; this aims to recover both the seisin thus lost, and the property of the thing: so that both rights are here blended together; that of property, and that of possession.

If a man lose his cause upon this writ, he is without all remedy.

There are two kinds of this writ: breve magnum de reso,
or breve de recto patens, a writ of right patent; and recto clauarium, a writ of right clore.

The first is so called, because sent open. It lies only for him that hath fee-simpie in the lands sued for, against the tenant of the freehold at least.

Indeed, the writ of right patent is extended, in practice, beyond its original intention; for a writ of right of dower, which lies for the tenant in dower, is patent; and so in several other cases. Fitzherb.
The writ of right clore, called also breve purum de recto, is directed to the lord of ancient demeine, or the bailiff of the king's manors; and lies for those who hold lands and tenements by charter, in fee-simpie, or in fee-tail, or for term of life, or in dower, if they be ejected out of such lands, or dispossessed. In such case a man, or his heirs, may sue out the writ of right clore, directed to the lord of ancient demeine, commanding him to do him right in his court. This is called a writ fecadum confuetudinem maneri. See Possession, Property, Title, and WRIT. Recto de advocacione ecclesie, a writ of right, lying where a man has right of advowson in fee to him, and his heirs; and, the incumbent dying, a stranger presents his clerk to the church; and he, not having brought his action of quarre impedit, nor darrein presentment, within six months, has suffered the stranger to usurp upon him. See Diffurance of Patronage, Quarre impedit, and Assisa darrein presentment.

Recto de cajfodia terce & baredis, a writ which lies for him whose tenant dying in his nongage, a stranger enters, and takes the body of the heir.

This writ was to lands holden in capite, or by knight's service, is become ufeless by the Stat. 12 Car. II. but not where there is a guardian in socage, or appointed by the laft will of the ancestor. See Guardian.

Recto de dole, a writ of right of dower, which lies for a woman that has received part of her dower, and proceeds to demand the remnant in the same town against the heir, or his guardian. This extends either to part or the whole, and is a more general remedy than that mentioned in the next article.

Recto de dole unde nihil habet, is a writ of right which lies in case where the husband, having divers lands and tenements, has assuied no dower to his wife; and she is thereby driven to sue for her thirds against the heir, or his guardian. See Dower, and Writ of Entry.

Recto quando ou quia dominus renovit, a writ of right, which lies in case where lands or tenements in the fignory of any lord, are in demand by a writ of right.

If the lord hold no court, or, at the prayer of the demandant or tenant, fend his writ to the king's court, to put the caufe thither for that time; this writ suffices for the other party, and has its name from the words comprized, which is the true occasion of it.

Recto de rationali parte, is a writ that lies between privies of blood, as brothers in gavel-kind, or filters, or other coparceners, as nephews and nieces, and for land in fee-simpie.

If a man lease his land for life, and afterwards die, leaving ifiue two daughters, and, after, the tenant for life likewise dies; the one ifiue entering on all the land, and fo deforcing the other, the ifiue so deforced shall have this writ to recover her part.

Recto fur disclaimer, a writ which lies where the lord, in the court of common pleas, does know upon his tenant, and the tenant disclaims to hold of him; upon which disclaimer the lord shall have this writ. This takes place when the tenant upon a writ of affile for rent, or on a replevin, disfouws or disclaims his tenure: whereby the lord lofs his verdict; in which case the lord may have this writ, grounded on this denial of tenure, and shall, upon proof of the tenure, recover back the land itself so helden, as a punishment to the tenant for his false disclaimer. This piece of retaliating justice, whereby the tenant who endeavours to defraud his lord is himself deprived of the estate, as it evidently proceeds upon feudal principles, so it is expressly to be met with in the feudal constitutions: "valalus, qui abnegavit feudum ejus conditionem, expoliatur." Recto folio. See Folio.

RECTOR of a parifh, the parson, or he who has the charge or cure of a parifh church. See Parson.

If the predial tythes of the parifh be inappropriate, i.e. either in lay hands, or in fome of thofe ecclesial communities, then, instead of rector, the parfon is called vicar, (which fee). In England are reckoned 3485 rectories.

The same rector denotes him governor or ruler, quia sanctum jus in ecclefia parochialis habeb, quantum praebuit in ecclefia collegiata.

RECTOR also denotes the chief elective officer in several foreign universities, particularly in that of Paris.

RECTOR is also used in several convents for the superior, or officer who governs the house.

The Jesuits used it for the superiors in fuch of their houses as were either feminaries, or colleges.

RECTORY, or RECTORES, Rectoria, a parifh church, parfonage, or spiritual living, with all its rights, glebes, and tythes.

RECTRICES, in Ornithology, denote the ftrong feathers of the tails of birds.

RECTUM Intestinum, in Anatomy; or in English, simply the rectum; is the laft portion of the large intestine, and of the whole alimentary canal. It begins at the left sacro-iliac symphysis, below the sigmoid flexure of the colon, and ends at the anus. See Intestine.

RECTUM, Abfeffes in the Neighbourhood of. See Fis- TULA in Ano.

RECTUM, Concreations and extraneous Substances lodged in.

The concreations formed in the larger intestines, and especially in the rectum, by the accumulation and protracted lodgment of the feces, may become the caufe of obstinate constipation, which can only be removed by their extraction. Sometimes these malaks of indurated matter include no extraneous subfance; in other instances, their nucleus is a biliary calculus; in a vaft number of cafes, they are merely compofed of the feces in a dry hardened state. It is remarked that women, and persons of advanced age, are most subject to the conftipation arising from the obfruction thus occasioned in the large intestines. Children and adults in the vigour of life are not, however, entirely exempt from the disorder, though they seldom have it, except when the formation of fuch concreations in the bowels has been brought on by swallowing a large quantity of hard indigefible bodies, like cherry and plum-tones. Lastly, excessively hardened malaks of fecal matter have been noticed in patients who have for a long while been confined to bed in the recumbent posture by severe disease.

Whatever may be the caufe of the disorder, whether the defect itself conffits in a mere accumulation of indurated feces, with which the rectum is dilated, and behind which the excrement is detained; or whether the conftipation is not complete, the concretion allowing the liquid part of the feces to pass out between it and the fide of the intestine; the existence of the hardened mass may be known by
by the conpilation which it produces; by the seive of weight which the patient feels about the fundament; and also by the possibility of actually touching the indurated obstructing body, when a finger is introduced up the rectum.

Oily emollient clysters, and carminative draughts, will serve for expelling such concretions as are not of too firm a consistence; but the extraction of them is absolutely necessary when they are particularly hard. The operation is to be done with a spoon, or suitable forceps, properly oiled; and, after the concretion has been removed, an emollient clyster is to be administered, in order to allay any irritation which may have been caused by the introduction of the requisite instruments. When the sphincter ani contracts so forcibly, as the operation is attended with extreme pain and difficulty, we are advised by surgical writers to make a dilatation of the anus, by pricking an incision at its posterior angle. A wound made in this direction cannot do injury to any part of consequence, whilst there would be a risk of wounding the urethra in the male, or the vagina in the female subject, if the cut were made at the anterior angle. An incision, carried laterally, would be apt to injure the pudic vessels. A division of the fibres of the sphincter ani does not produce any material permanent weakness of its action, and a paralysis of this muscle, according to Richerand, can never proceed from such a cause.

Nefografia Chirurgicale, tom. iii. p. 414, edit. 2.

The hard concretions which lodge in the rectum cannot be reached with the finger when they are situated high, and, in this circumstance, the surgeon must use a probe, or found, in order to assure himself positively of their presence, their movableness, and their size.

With regard to foreign bodies lodged in this intestine, some have been swallowed, and have passed through the whole extent of the alimentary canal; whilst others have been pushed up the anus to a greater or lesser height. The extraction of these lumps is generally attended with a great deal of difficulty, and even demands on the part of the operator more than ordinary dexterity, in consequence of the various shapes, the hardnes, and the fragility of these different bodies. Glass phials, instrument cafes, shuttles, &c. have been introduced into the rectum by maniacs. One person of this description put into his rectum a rented flint, which did not admit either of being extracted, or broken, owing to its hardnes, and slippery surface, and which in the end caused the patient to die in the greatest agony, with swelling and gangrenous mischief in the abdomen. Marchetti has recorded an instance, in which a pig's tail, hardened by cold, was forcibly thrust up the rectum of a girl of the town. This extraneous body could not be withdrawn, as the short bristles, which all inclined outward, immediately came into contact with and pierced the inner part of the bowel. It remained in the part fix days, and occasioned a train of alarming symptoms, such as fever, vomiting, swelling of the abdomen, and obliterative constipation. Marchetti failed a ligature to the end of the foreign body, which protruded at the anus, and then pulled the ligature through a long piece of reed, which he introduced up the rectum, in order that the foreign body might be drawn through this tube without the intestine being lacerated. The experiment was completely successful.


In another example a piece of wood, three inches long, and two in width, was introduced into the rectum. Colic, tension of the abdomen, fever, constipation, and difficulty of making water, came on, and lasted fix days. The impossibility of removing the extraneous substance with a pair of forceps, led to the idea of using a borer, which, having been passed up the rectum under the guidance of the finger, was inserted deeply enough into the piece of wood to draw it out. The extraction, however, could not be effected without a great deal of pain. See Mélanges de Chirurgie, par M. Saucorcer, p. 484. Mémoires de l'Académie de Chirurgie, tom. v. p. 605. Laflus, Pathologie Chirurgicale, tom. ii. p. 569, edit. 2.

RECTUM. Congenital and Syphilitic Contractions of its inferior Portion. A contraction of the lower end of the rectum is sometimes an original malformation; but more frequently it arises from what has been considered by various surgical authors to be a vesical thickening of the parietes of this intestine. If this be really a syphilitic disorder, a circumstance which is to be doubted, it is certainly as grievous as any of the more common effects of the vesical disease. Excrecences grow from the mucous membrane at the rectum, and discharge a purulent matter, which is continually oozing from the anus. When a finger is passed within this aperture, the irregularities occasioned by the tumour may be plainly felt. Such writers as believe in the syphilitic nature of this complaint inform us, that the truth of this may be known by the antecedent and co-existent symptoms of the vesical disease. They admit, however, that the disorder almost always lasts after the cure of every other mark of syphilis, and they caution us not to pervert rathly in administering mercury any longer for a disease which cannot be further benefited by it. These circumstances are quite sufficient to prove that there is not much reason for the doctrine, that this fort of contraction of the lower end of the rectum is vesical.

Such writers as consider the complaint to be connected with syphilis, of course recommend the exhibition of mercury, and they further advise the frequent injection into the rectum of a weak solution of the oxymurate of the same mineral. Tents, lined with mercurial ointment, are also recommended to be passed into the bowel. The latter applications are rated to have the advantage : if, of opposing, by mechanical pressure, the further increase of the excrecences; &c., of dilating the contracted part; and, 3dly, of acting on the disease by their medicinal quality.

For our own part, we much doubt the reality of the vesical nature of the foregoing complaint. The language of the advocates for such a doctrine must raise suspicions, that they are influenced in their judgment more by prejudice than reason. "The vesical affection of the coats of the rectum (says one of these writers) almost always lasts after the total extinction of the syphilitic virus. Then, we ought to be content with the employment of dilating mechanical means, without perverting in the use of medicines, which would serve only to ruin the patient's constitution.

An elastic girdle cannis is to be preferred, and it should be of a conical shape, in order that it may be gradually introduced further and further, in proportion as the dilatation of the bowels is effected." Richerand, Nefografia Chirurg. tom. iii. p. 418, edit. 2.

In cases of congenital contraction of the rectum, the only plan which can be adopted, is that of making an incision through the posterior part of the intestine.

RECTUM. Polypi of. Sometimes, though not often, polyopi grow from the mucous membrane of the rectum, and by their size obstruct the passage of the feces. Their existence is at first manifested by an uneasy sense of heaviness, and afterwards they are protruded outwardly in the efforts which the patient makes to stool. The anus contracting after their expulsion, their roots become strangulated, so that they cannot return, and excessive agony is produced.
In this circumstance, the surgeon should take the opportunity of removing them with a knife, after having tied their root, or even without this precaution. The lining of the rectum, freed from the weight of the tumour, immediately retracts, and if the polypus should have received a supply of blood from a large vessel, hemorrhage may ensue. Such accident may be remedied by completely detinding the distended part of the rectum with a large piece of sponge, or with a compres of lint; but as it is easier to prevent the hemorrhage altogether, than to stop it after it has occurred, we would advise surgeons, whenever the exscrecence is of any size, always to tie its root before removing the rest of it with a cutting instrument.

Rectum, Prolapsus of. See Prolapsus Ani.

Rectum, Serratus-contracted. Serratus of the rectum is not uncommon at an advanced period of life. Sometimes it extends over a considerable length of the gut, but generally it is more circumfered. The coats of the bowel become much thicker and harder than in the natural state. The muscular coat is subdivided by membranous septa, and the internal coat is sometimes formed into hard irregular folds. The surface of the inner membrane is occasionally ulcerated, so as to form a cancerous disease. Every vellige of the natural structure is occasionally lost, and the gut is changed into a gritty substance. The cavity of the bowel is always rendered narrow at the serratus part, and is sometimes almost obliterated. When the passage through the gut is much obstructed, the bowel is always a good deal enlarged just above the stoppage, or stricture, from the accumulation of the feces there. As the disease advances, adhesions form between the rectum and adjacent parts, and ulcerations produce communications between them.

The disease is usually not much noticed till somewhat advanced, not being at first very painful. The patient only thinks that he is coughing, and that he voids his stools with a little difficulty. In time, a good deal of pain is felt in the part affected, especially at stool, after which some relief is experienced. Pass and blood may sometimes be noticed with the excrement, particularly when the disease has advanced to the ulcerated state. The patient at length becomes ill at ease, the constitution suffers, and dilatation follows. Severe tenesmus attends the whole course of the disease.

Defect has often seen the disease form a communication between the rectum and vagina, and the feces have passed through the latter part. In the latter stage of the affliction, the rectum, bladder, vagina, uterus, and adjacent parts, are all involved in one common ulceration.

When the disease has attained the ulcerated state, it is probably always incurable. Palliatives can now only be resorted to, such as anodyne and emollient glypters, the warm-bath, &c. with the exhibition of medicines like opium, cucuta, uva ursi, &c. Claudius applied his remedies to the inside of the bowels by means of tents, and did not employ the latter as a mode of curing the disease, when less advanced. Valsalva used to introduce a cannula pierced with numerous holes, when his patient got into the bath, so as to let the fluid enter the intestine. Numerous practitioners, among them Morgagni, made mercureals the base of their treatment, from a supposition that the complaint was of venereal origin.

When the disease is not attended with ulceration, the contraction and thickening of the gut may be diminished by introducing bougies, keeping them for a certain time, every day, so introduced, and increasing their size gradually. The prebure of these instruments seems to lessen the disease, and stop its progress; a proof that its nature differs from that of what is usually understood by serratus. Default used to employ long tents, made of lint, smeared with cerate, and passed into the bowels by means of a probe, with a forked end. This surgeon gradually increased the size of the tents, so as to continue the compression, to which he conceived all the good was owing. Their length was also augmented by degrees. Fresh ones were, at first, introduced twice every day. When any hardnesse were situated on the outside of the anus, Default cured them on the same principle, viz. by making pressure on them with compres and a bandage. This eminent surgeon effected a cure of a serratus-contracted rectum by this method. The woman was taught to pass occasionally the tents herself, so as to prevent a relapse. The disease is said to afflict women more frequently than men: from a comparative table kept at the Hôtel-Dieu, this has been the case there in the proportion of ten to one. See Œuvres Chirurgicales de Default, tom. ii. p. 422.

Rectum, Hemorrhoidal Swellings of. See Hemorrhoids.

Rectum, in Law. See Recto.

Rectum, in our old Law Writers, is also used for a trial or accusation.

Rectum, Commune, denotes a trial at law, or in the common course of law. Stare ad rectam, denotes to fland a trial. Rectum rogare, to petition the judge to do right.

Rectus, in Anatomy, a name applied to several muscles, generally, but not invariably, distinguished by the straightness of their fibres, or of their general direction.

Rectus abdominis. See Obliquus.

Rectus abducens, or externus, &c. muscles of the globe of the eye. See Eye.

Rectus deprimens, or inferior,

Rectus anterior cruris, or femoris, synonymes of the Rectus cruris; Rectus extensor cruris, or femoris, which fee.

Rectus capitis anticus major et minor. See Rectus internus.

Rectus capitis internus major, rectus anticus major, tracheo-tons-occupitien; a muscle of the head, flattened, broader and thicker above than below, occupying the anterior and lateral part of the neck, and reaching from the transverse processes of the sixth cervical vertebra, to the inferior surface of the biliary process of the occiput. Its anterior surface is covered by the carotid artery, the internal jugular vein, the nerve of the eighth pair, the great sympathetic, and the pharynx. The longus colli, the rectus capitis internus minor, the articulations of the occipit and atlas, and of the latter bone, and the second vertebrae, are covered by its posterior surface. The inner edge lies on the longus colli, and is connected to it by cellular substance: the outer is fixed to the front of the transverse processes of the fifth, sixth, fourth, and third cervical vertebrae, and is unattached above the latter. The lower end, very thin and pointed, is fixed to the transverse processes of the sixth cervical vertebra: it ascends with a little obliquity from without inwards, increasing in breadth and thickness: it approaches the muscle of the opposite side, and is attached by its upper end to the biliary process of the occipital bone, in front of the foramen magnum. At the upper part of this muscle is a broad and thin aponoeuros, which depends on the anterior and inner surface; the attachments to the transverse processes are by small tendons terminating in muscular portions. The muscular fibres run obliquely between the last mentioned tendons and the aponoeuros.

This muscle bends the head forwards on the neck; and restores it after it has been carried backwards. The muf-
of one side, acting singly, inclines the head towards its own side.

Rectus capitis internus minor, or rectus anticus minor, tra-chelio-masto-occipitius; a small muscle of the head, lying under the lait, short, narrow, and flattened, and extending from the atlas to the occiput. It is covered in front by the rectus internus major, the internal carotid artery, and the great sympathetic nerve; behind it covers the capsule of the articulation between the atlas and occiput. The outer and inner edges present nothing remarkable. Its lower extremity is fixed to the anterior surface of the lateral portion of the atlas, and to the neighbouring part of its transverse process. Thence it ascends, increasing somewhat in size, and inclined a little inwards, and is fixed to the under surface of the baddary processes of the occiput, behind and a little on the outside of the rectus internus major, and to the cartilaginous mass filling the space between the occipital and temporal bones. It has aponeuroses at its extremities, and very short muscular fibres between these.

Its action on the head is exactly the same with that of the rectus internus major.

Rectus capitis lateralis, le premier transfereur antérieur Winflow, alétoïdo-mastoïden, petit droit latéral; a small muscle of the head, situated at the upper and lateral part of the neck, flattened and quadrilateral, reaching from the transverse process of the atlas to the occiput. It is covered in front by the internal jugular vein; and it covers behind the vertebral artery. The two edges present nothing remarkable. Below it is fixed to the front of the upper surface of the transverse process of the atlas: thence it ascends a little outwards, and is attached above to the rough impression behind the jugular fossa. It is muscular, except jux at the attachments, which are tendinous. Its action, like that of the two last muscles, is to reftore the head, when it has been bent backwards; to bend it forwards; and, when one muscle acts singly, to incline it laterally.

Rectus capitis pfflicosus major, axoïdo-occipitius; a muscle of the head, of a triangular flattened figure, placed at the upper and back part of the neck, and extending from the spinous processes of the second cervical vertebra to the occiput. Its posterior surface is covered by the complexus, and above by the obliquus superior capitis; the anterior surface covers the posterior arch of the atlas, the rectus pfflicosus minor, and the occiput. The inferior extremity, narrow, and almost pointed, is attached to the spinous processes of the second cervical vertebra, thence it ascends, directed outwards, and a little backwards, and gradually increasing in breadth, to be inserted in the inferior surface of the occiput, at about an equal distance from the great external transverse ridge, and the foramen magnum, between the complexus, the obliquus superior, and the rectus pfflicosus minor. The extremities alone are tendinous; the rest being muscular. It reftores the head, when it has been bent forwards; and carries it back on the vertebral column. When one muscle acts singly, it will have the power, from the oblique direction of its fibres, of rotating the head, so as to turn the face towards its own side.

Rectus capitis pfflicosus minor, alétoïdo-occipitius; a small flattened muscle with radiated fibres, and consequently a triangular figure, placed at the upper and back part of the neck, extending from the atlas to the occiput, and lying with its fellow in the interval between the two recti majores. Its posterior surface is inclined downwards and covered by the complexus; the anterior surface corre-sponds to the occiput, and to the interval between it and the atlas. The lower extremity is the narrowest part, and is fixed to the rough impression in the middle of the pos-
terior surface of the posterior arc of the atlas: it ascends parallel to the opposite muscle and directed backwards, and is fixed to the external surface of the occipital bone at a short distance from the foramen magnum. It raises the head when bent forwards; and extends it or carries it back on the neck.

Rectus cruris, rectus extensor or anterior cruris, droit ou grêle antérieur, leu-ro-totailien; a muscle of the thigh, long and flat, broad in the middle, and narrow towards its extremities, occupying the middle and front part of the limb, and reaching from the anterior and inferior spine of the ilium to the patella. It is covered in front by the iliaceus internus, the fatorius, and the facia lata; behind it covers the orbicular ligament of the hip, the great extensores of the knee, and the external or anterior circumflex vessels. The outer and inner margins of the muscle are unattached in their upper three-fourths; they are confluent, in their lower fourth, with the extensores of the knee.

The superior extremity of the rectus cruris presents two tendons, one of which is straight, the other curved. The former is fixed to the anterior and inferior spine of the os innominatum: the latter, curved from before backwards, and from above downwards, is fixed to the outer surface of the os innominatum for about an inch, immediately above the edge of the acetabulum. From this upper attachment the muscle descends vertically in front of the thigh, growing broader to the middle of the limb; it then becomes narrow towards the lower part, and is fixed to the basis of the patella.

The rectus is tendinous at its extremities, and fibrous in the middle. The upper tendon has been already described as divided into two portions; the anterior of these, attached to the anterior and inferior spine of the os innominatum, is the thickest and shortest, and has the same direction as the muscle; the other is longer and curved, and attaches some fibres to strengthen the orbicular ligament of the hip. The two portions soon unite in a common tendon; this spreads out into a broad aponeurosis, which descends about four inches on the front of the muscle, and then dips into its substance. The inferior tendon is broad and flat, and rises from the basis of the patella; its posterior surface is united to the great extensores of the knee, and the edges are strongly connected to the vallate externus and internus. It is broad at the patella, grows a little narrower as it rises, then spreads out again, and forms a broad aponeurosis, covering the back of the muscle above its middle. The superficial fibres of this tendon extend over the front of the patella, to which they are strongly united, and are left below in the tendon which unites this bone to the tibia. The muscular fibres are placed very obliquely between the superior and inferior tendons: they cover the back of the first up to the part where its two portions separate; and they descend on the front of the second to within two inches of the patella.

It extends the knee-joint, either by bringing the leg forwards upon the thigh, or the thigh upon the leg, according as the one or the other part is rendered a fixed point. If the knee be extended, or firmly retained in the bent position by its flexor muscles, the rectus may bend the thigh upon the pelvis: when the leg and thigh are fixed, it can bend the pelvis forwards upon the latter, as in the attitude of stooping to pick up any object from the ground. In the erect attitude it prevents the pelvis from inclining backwards; and reforces it when it has been carried in that direction.

Rectus in curia, in Law, one who stands at the bar, and no man objects any thing against him.
When a man hath revered the outlawry, and can participate of the benefit of the law, he is said to be relictus in curia.

Reculver, in Geography, a village and parish in the upper half hundred of Blean Gate, lathe of St. Augustine, and county of Kent, England, is situated at the distance of 10 miles N.E. by N. from Canterbury. It is noted in history as the site of the Roman Reculver, which was a strait or cause which defended the northern entrance to the celebrated Portus Rutupensis. It is remarkable, that while the ocean has receded from the southern entrance, leaving Richborough (Rutupium) considerably inland, it has gradually advanced upon Reculver. This is proved on the authority of several ancient writers, particularly Leland, who states, that in his time it stood about half a mile from the shore, whereas, at present, the tide washes the walls of many of the village houses, and threatens to overwhelm the whole at no distant period. Reculver was a strait of much importance, as it not only commanded an extensive view of the open sea, but likewise of the mouths of the Thames and the Medway. It was therefore used as a watch-post to discover the approaches of an enemy; and also as a light-house to guide sailors. Its perfect flat is an islet of a square form, with the angles rounded off, and was en-vironed by a ditch exterior to the walls, of which a considerable portion still remains. The extent of the enclosed area from eait to well is about 150 yards, and from south to north about 198 yards. The ancient town was without the islet, and is supposed to have been on the north, on that part of the coast long since swallowed up by the waves: and from the present shore, as far as a place called Black Rock, seen at low water mark, where, according to tradition, a church once stood, there have been found great quantities of tiles, bricks, fragments of walls, tessellated pavements, and other marks of a ruined town; and remains of the household furniture, drefs and equipment of the horse belonging to its inhabitants, are continually met with among the sands; for after the fall of the cliffs, the earthy parts of them being washed away, these metaline substances remain behind. When a part of the cliff here fell down about the conclusion of the fourteenth century, a number of small vaults, arched over, and several cisterns, were discovered. The latter were all of the same figure, namely, square, and measured from ten to twelve feet in length each side, and the same in depth. They were constructed of quarters, driven deep into the ground, with planks two inches thick fixed to them. Their use was evidently the reception and preservation of rain water, which the Romans thought more wholesome than spring water. Vast quantities of Roman coins have been discovered both in the fields and along the shore here; and Du Fresne has produced many, which, from the markings upon them, appear to have been struck at a mint in this place. Britsh and Gaulish coins are likewise occasionally found here; also seals, keys, spoons, gold rings, bracelets, filigree, bullae, belts, bridles, harness, beams of scales or flagiars, and many other articles of which the use has not yet been determined.

When Kent was subdued by the Saxons, Regulbium, became a principal seat of the monks of that dynasty. It was then called Raculf and Raculf-stiger; and hither king Ethelred retired with his court, after his conversion to Christianity by St. Augustine. In the next century, it obtained the name of Raculf-minister, from a Benedictine abbey founded here by Boffa, a priest and nobleman, to whom lands were granted for that purpose by king Egbert, as an atonement for the murder of his two nephews. This abbey was dissolved previous to the Conquest, having probably been destroyed by the Danes. The town, however, continued in a flourishing condition for many years after the event, and had the privilege of a weekly market granted to it in 1513; but this right has been long discontinued. The church here is an ancient and spacious edifice, consisting of a nave, with two aisles, a chancel, and two lofty towers, surmounted by spires at the angles of the west front. The nave is separated from the aisles by five pointed arches, rising from short oblong piers; and from the chancel by three small semi-circular arches, springing from tall round columns, with very singular capitals. In this church kings Ethelbert I. and II. are said to have been buried; and a monument erected to the memory of the first is described by Weever in his "Funeral Monuments," though it has now disappeared. On the floor of the chancel are several brasses of great antiquity. (See Richborough.) Beauties of England and Wales, vol. vii. by E. W. Brayley. History and Antiquities of Reculver and Herne, by W. Battelley, D. D. 8vo.

Recumpado, in Geography, a town of Hindoos, in the circar of Rajamundry; 23 miles N.W. of Rajamundry.

Recuperatores, among the Romans, were commissioners appointed to take cognizance of private matters in dispute, between the subjects of the state and foreigners, and to take care that the former had justice done them.

It came at last to be used for commissioners, to whom the prorog referred the determination of any affair between one subject and another.

Recurrens, in Anatomy, a name under which the inferior laryngeal branch of the par vagum is often described, from the circumstance of its arising in the chest below the point of its distribution to the larynx, and then going back into the neck in a retrograde course. See Nerve.

Recurring Series, is a series so constituted, that each succeeding term is connected with a certain number of the terms immediately preceding it, by a certain and variable law; as the sums or differences of some multiples of those terms. Thus the series

\[ a, b, \gamma, \delta, \epsilon, \theta, \&c. \]

is a recurring series; for these terms being respectively represented by \(a, b, \gamma, \delta, \&c.\) we have

\[ \gamma = 2 \times \beta - \alpha \times 2 \]
\[ \delta = 2 \times \gamma - \alpha \times 2 \]
\[ \epsilon = 2 \times \delta - \alpha \times 2 \]
\[ \theta = \&c. \]

that is, each term is equal to 2 \( \times \) times that which precedes it, minus \( \alpha \times 2 \) times the one preceding the last.

Or, generally, let

\[ a, b, c, \gamma, \delta, \epsilon, \theta, \&c. \]

be any series whose terms are denoted as above, by \(a, \beta, \gamma, \delta, \&c.\) Also, let \(\mu, \nu, \pi, \ldots\) \&c. represent the successive multipliers by which the terms are connected, so that

\[ a = a \]
\[ \beta = \beta \]
\[ \gamma = \mu \times \beta + \nu \times \alpha + \&c. \]
\[ \delta = \mu \times \gamma + \nu \times \beta + \&c. \]
\[ \epsilon = \mu \times \delta + \nu \times \gamma + \&c. \]
\[ \theta = \&c., \&c. \]

then this series is called a recurring series; and \(\mu + \nu + \&c.\) De Moivre calls the scale of relation, which is said to be of one, two, three, \&c. terms, according to the number of multipliers
RECURRING SERIES.

In the above we have used only two, \( \mu \) and \( \nu \), whence \( \mu + \nu \) is called the scale of relation, which is here of two terms; and 1 minus the scale of relation, as \( 1 - \mu - \nu \), is called the same author the differential scale, which is always equal to the denominator of the fraction from which the series is produced.

If, in the above series, the terms had the relation

\[
\begin{align*}
\alpha &= x \\
\beta &= \beta \\
\gamma &= \gamma \\
\delta &= \mu x \cdot \gamma + v x^3 \cdot \beta + \xi x^3 \cdot \alpha \\
\epsilon &= \mu x \cdot \delta + v x^3 \cdot \gamma + \xi x^3 \cdot \beta \\
\theta &= \mu x \cdot \epsilon + v x^3 \cdot \delta + \xi x^3 \gamma \\
&\text{etc. etc.}
\end{align*}
\]

then the scale of relation would be \( \mu + v + \xi \), which is of three terms; and the differential scale, or the denominator of the fraction, is \( 1 - \mu - v - \xi \).

The following problems are naturally connected with the doctrine of recurring series; viz.

1. Any recurring series being proposed, to find the scale of relation, or the law of the series, which is not always obvious on inspection.

2. To find the sum of an infinite recurring series, or the sum of any number of its terms \( (n) \).

3. To find a general expression for any indefinite term of such a series, as, for example, the \( n \)th term.

We shall consider each of these problems under their separate heads.

1. To find the scale of relation in any proposed recurring series.

Let \( a, b, c, d, e, f \), &c. be a recurring series, of which it is required to find the scale of relation.

Assume

\[
\begin{align*}
\beta &= \mu \gamma + \nu \beta + \xi \gamma + \delta \\
\epsilon &= \mu \delta + v \gamma + \xi \beta \\
\theta &= \mu \gamma + v \beta + \xi \delta + \epsilon \\
&\text{etc. etc.}
\end{align*}
\]

Where \( \beta, \gamma, \delta, \epsilon \) are known, and \( \nu, \xi, \gamma \) &c. unknown quantities, whose numerical values are required, and which are readily found by the usual method of elimination. Thus in the above, using only \( \mu \) and \( \nu \), we have

\[
\mu' = \frac{\beta - \gamma + \nu \beta}{\gamma - \nu \beta}, \text{ and } \nu' = \frac{\beta - \gamma}{\beta - \gamma}.
\]

These values of \( \mu' \) and \( \nu' \) will obviously contain in them the powers of the indeterminate quantity \( x \), which being taken out, we shall have the required numerical values of \( \mu \) and \( \nu \).

Let it be required to ascertain the scale of relation in the series

\[
\alpha, \beta, \gamma, \delta, \epsilon, \theta, \text{ &c.}
\]

Here, by substituting the proper values of \( \beta, \gamma, \delta, \epsilon \) &c. in the above equation, we have

\[
\mu' = \frac{35 x^3 - 27 x^5}{26 x^3 - 21 x^5} = \frac{8 x^3}{4 x^5} = 2 x
\]

\[
\nu' = \frac{49 x^3 - 45 x^5}{21 x^3 - 25 x^5} = \frac{4 x^3}{-4 x^5} = \frac{x^3}{-4 x^5}
\]

when \( \mu = 2 \), and \( \nu = -1 \).

The same method may obviously be employed in any other case; but in order to know whether or not we have assumed a scale of relation of a sufficient number of terms, we must repeat the same process upon three other terms, of which one at least was not before employed; and if both give the same values, we may be assured of the truth of our results; or we may otherwise, instead of repeating the operation, examine the several terms, and see whether they agree with the law we have determined, and if not, we must increase the terms in our scale of relation; for it may be observed, that we can never fail of determining them in consequence of having assumed too many terms, as we shall, in that case, have one of our results zero.

Here it is evident, that the whole sum

\[
S = \alpha + \beta + \gamma + \delta + \epsilon + \theta + \text{ &c.}
\]

\[
S = \alpha + \beta + \mu \cdot x (\gamma + v \cdot \beta + \xi \cdot \alpha) + v \cdot x \beta (\gamma + v \cdot \beta) + \xi \cdot x^3 \beta (\gamma + v \cdot \beta) + \delta + \epsilon + \theta + \text{ &c.}
\]

which is a general expression when the scale of relation is of two terms.

When the scale of relation is of three terms, so that

\[
\alpha = \alpha \\
\beta = \beta \\
\gamma = \gamma \\
\delta = \mu x \cdot \gamma + v x^3 \cdot \beta + \xi x^3 \cdot \alpha \\
\epsilon = \mu x \cdot \delta + v x^3 \cdot \gamma + \xi x^3 \cdot \beta \\
\theta = \mu x \cdot \epsilon + v x^3 \cdot \delta + \xi x^3 \gamma \\
&\text{etc. etc. &c.}
\]

it is equally obvious that

\[
S = \alpha + \beta + \gamma + \mu \cdot x (\alpha + \beta + \gamma + \text{ &c.}) + v \cdot x \beta (\gamma + \beta + \gamma + \text{ &c.}) + \xi \cdot x^3 \beta (\alpha + \beta + \gamma + \text{ &c.}),
\]

or

\[
S = \alpha + \beta + \gamma + \mu x (S - \alpha - \beta) + v x^3 (S - \alpha) + \xi x^3 S + \text{ &c.}
\]

whence we have

\[
S = \frac{\alpha + \beta + \gamma - \mu \cdot x (\alpha + \beta) - v \cdot x^3 \cdot \alpha}{1 - \mu x - v x^3 - \xi x^3}
\]

which is the general expression for the sum, when the scale of relation is of three terms.

In the same manner we have

\[
S = \frac{\alpha + \beta + \gamma + \mu x (\alpha + \beta + \gamma) - \mu x^3 \cdot (\alpha + \beta) - \xi x^3 \cdot \alpha}{1 - \mu x - v x^3 - \xi x^3}
\]

for a scale of relation of four terms; and so on.

But as the terms \( \alpha, \beta, \gamma, \delta \) &c. contain in them certain powers of \( x \), we may reduce the above expressions to simpler forms.
RECURRING SERIES.

II.—To find the general term of any proposed recurring series.

From the preceding part of this article it appears, that every recurring series may be considered as arising from the development or expansion of some rational fraction of the form

\[
\frac{a + bx + cx^2 + dx^3 + \&c.}{1 - \alpha x - \beta x^2 - \gamma x^3 - \delta x^4 - \&c.}
\]

Let us, therefore, suppose this fraction to be converted into the infinite recurring series \(A + Bx + Cx^2 + Dx^3 + \&c.\) of which we already know how to determine the co-efficients, and the law of their formation.

Now if this rational fraction be decomposed into its simple fractions by the method explained under the article RATIONAL FRACTIONS, and each of these simple fractions be then converted into a recurring series, it is evident that the sum of all these series ought to be equal to the original series

\[
A + Bx + Cx^2 + Dx^3 + \&c.
\]

Now each of these partial fractions being of the form

\[
\frac{A'}{1 - r x^n}
\]

the series thence arising will have the form

\[
A' + A'r x + A'r^2 x^2 + A'r^3 x^3 + \ldots + A'r^n x^n
\]

of which \(A'r^n x^n\) is the general term. Hence, the several series arising from the partial fractions may be supposed to be

\[
A' + A'r x + A'r^2 x^2 + A'r^3 x^3 + A'r^4 x^4 + \ldots + A'r^n x^n
\]

and since the sum of these series is equal to the original one proposed, we know that the co-efficients of the like powers of \(x\) are all equal, whence we have

\[
A = A' + A'' + A'' + A''' + \&c.
\]

\[
B = A'r + A''r + A'''r + A''''r + \&c.
\]

whence it appears that the co-efficient of any term \(x^n\) of the recurring series is equal to the sum of the co-efficients of the same power of \(x\), which arise from expanding the several simple fractions into which the given fraction is decomposed; and this co-efficient is always equal to the sum of each of the numerators of the several simple fractions, multiplied into the \(n\)th power of the corresponding value of \(r\) in the denominator of the same fraction, at least while the denominator contains no equal factor. But if, among the partial fractions,

\[
\frac{A}{(1 - r x)^n}
\]

is required

there is any one of the form

\[
\frac{A}{(1 - r x)^n}
\]

the general term of this will be \((n + 1) A r^n x^n\); of \(\frac{A}{1 - r x}\), the general term is \(\frac{(n + 1)(n + 2)}{1 \cdot 2} A r^n x^n\); and universally \(\frac{A}{1 - r x} \), the general term is

\[
\frac{(n + 1)(n + 2)(n + 3) \ldots (n + k - 1)}{1 \cdot 2 \cdot 3 \ldots (k - 1)} A r^n x^n
\]

we may, therefore, in all cases wherein the generating fraction of the original series admits of a rational decomposition, arrive very readily at the general term upon the principles above explained.

Thus,
RECURRING SERIES.

Thus, as an example, let there be proposed the recurring series

\[ 1 + 4x + 14x^2 + 46x^3 + 146x^4 + \&c. \]

to find the general term, or the co-efficient of \( x^n \).

The sum of this series is found by the preceding part of this article to be \( \frac{1 - x}{1 - 5x + 6x^2} \).

This rational fraction is equal to \( \frac{1}{1 - 2x} + \frac{2}{1 - 3x} \).

Now the general term of \( \frac{1}{1 - 2x} \) is \( 2^n x^n \); and of \( \frac{2}{1 - 3x} \)
is \( 2 \cdot 3^n x^n \), as shewn above; therefore the general term of the proposed series will be \( (2 \cdot 3^n - 2^n) x^n \).

It may be observed, however, that this method is in some cases very laborious, and not always practicable; it will, therefore, frequently be better to make use of the multinomial theorem, which may be done by putting the generating fraction under the form

\[ (a + b + c x + \&c.) \frac{1}{1 - a x - b x^2 - c x^3 - \&c.} \]

See Multinomial Theorem.

IV.—To find the sum of any number \( n \) terms of a recurring series.

For this purpose it is only necessary to find the co-efficient of the \( n + 1 \)th term of the series. Then, from the sum of the entire series subtract the sum of the series beyond the \( n \)th term, and the difference will obviously be the sum of the first \( n \) terms sought.

Let there be proposed as an example to find the sum of \( n \) terms of the series

\[ 1 + 2x + 3x^2 + 4x^3 + \ldots \ldots nx^{n-1}. \]

The infinite sum of this series readily found \( \frac{1}{(1 - x)^2} \).

In the second case, viz. of the terms beyond \( nx^{n-1} \), the series is

\[ (n + 1)x^n + (n + 2)x^{n+1} + (n + 3)x^{n+2} + \&c.; \]

and in the formula \( s = \frac{a + \beta - \alpha \mu x}{1 - \mu x - \nu x^2} \) we have only to substitute \( a = (n + 1)x^n \), and \( \beta = (n + 2)x^{n+1} \), instead of \( a = 1 \) and \( \beta = 2x^n \), as in the former. Hence we have

\[ s' = \frac{(n + 1)x^n + (n + 2)x^{n+1} + \ldots}{1 - 2x + x^2}, \]

or

\[ s' = \frac{(n + 1)x^n + nx^{n+1}}{1 - x}. \]

and, therefore, \( s = s' \), or the sum of the first \( n \) terms is equal to \( \frac{1 - (n + 1)x^n + nx^{n+1}}{(1 - x)^2} \).

2. Required the sum of \( n \) terms in the series

\[ 1 + 3x + 5x^2 + 7x^3 + \ldots \ldots (2n - 1)x^{n-1}. \]

Here, by trial, we find the scale of relation to be \( \mu = + 2 \), and \( \nu = - 1 \), as before; therefore the infinite sum is

\[ s = \frac{a + \beta - \alpha \mu x}{1 - \mu x + x^2} = \frac{1 + 2x - x^2}{1 - 2x + x^2} = \frac{1 + x}{(1 - x)^2}. \]

After \( n \) terms, the series becomes

\[ (2n + 1)x^n + (2n + 3)x^{n+1} + (2n + 5)x^{n+2} + \&c. \]

which therefore arises from the fraction

\[ \frac{(2n + 1)x^n + (2n + 3)x^{n+1} - 2(2n + 1)x^n}{1 - 2x + x^2} = \]

\[ \frac{(2n + 1)x^n - (2n - 1)x^{n+1}}{(1 - x)^2}. \]

whence the sum of \( n \) terms is

\[ \frac{1 + x - (2n + 1)x^n + (2n - 1)x^{n+1}}{(1 - x)^2}. \]

3. Required the sum of \( n \) terms of the series

\[ (n - 1)x + (n - 2)x^2 + (n - 3)x^3 + \&c. \]

Here again the scale of relation is \( + 2 - 1 \); therefore the infinite sum is

\[ \frac{(n - 1)x + (n - 2)x^2 - 2(n - 1)x^3}{(1 - x)^2}. \]

After \( n \) terms, it becomes \( x^{n+1} - 2x^{n+2} - \&c. \), the sum of which is found in the same manner to be \( \frac{x^{n+1}}{(1 - x)^2} \); therefore \( n \) terms of the series is

\[ \frac{(n - 1)x - nx^n + x^{n+1}}{(1 - x)^2}. \]

Hence, also, \( n \) terms of the series

\[ \frac{(n - 1)x}{n} + \frac{(n - 2)x^2}{n} + \frac{(n - 3)x^3}{n} + \&c. \]

is found to be

\[ 1 + x - (n + 1)x^n + (2n^2 + 2n - 1)x^{n+1} - n!x^{n+2} \]

the scale of relation being \( 3 - 3 \).

In all the preceding examples we have determined the infinite sum of the series, as beginning at the first term, and at the \( (n + 1) \)th term, a more easy method is as follows, which is due to Simpson. Effays, p. 96.

Let \( A + B + C + D + \ldots + K + L + M + N \) be any finite recurring series, of which each term depends upon the three which precede it, the scale of relation being \( p, q, r \), so that

\[ \begin{align*}
  pA + qB + rC &= D \\
  pB + qC + rD &= E \\
  &\ldots intersect.
\end{align*} \]

or, which is the same,

\[ \begin{align*}
  pA + qB + rC + D &= 0 \\
  pB + qC + rD + E &= 0 \\
  pC + qD + rE + F &= 0 \\
  &\ldots intersect.
\end{align*} \]

whence,
whereby, by addition

\[
\rho (A + B + C + \cdots K) + q (B + C + D + L) + r (C + B + D + \cdots M) = 0
\]

or, representing the whole sum by \( S \),

\[
\rho (S - L - M - N) + q (S - A - M - N +) + r (S - A - B - N) = 0
\]

which, by addition and division, gives

\[
\rho (L + M + N) + q (A + M + N) + r (A + B + C) = \rho + q + r - 1
\]

where the sum depends merely upon the three first and the three last terms of the series; and a similiar expression, it is obvious, may be obtained for any other scale of relation.

It may not be amifs to observe, that when the proposed series is wholly numeral, (the sum of which, as we have before observed, is to be found by making \( x = 1 \)); both this formula and the preceding one fail, in the case in which the denominator of the fraction becomes zero, and we must, therefore, in such cases, have recourse to other methods of summation, as given under the article Series.

On this subject the reader should consult De Moivre's Misc. Analyt. and his Doctrine of Chances, and Euler's Analysis Infinitorum, where he will find an explanation of its application to the approximation to the roots of equations. Collon's Comment on Newton's Fluxions. Stirling's Methods Differ. Cramer's Analyse des Lignes Courbes. Bernoulli de Serieb. Inf. &c. See also a chapter on this subject, in vol. ii. of Bonnycastle's Algebra.

RECURVIROSTRA, the Avocet, in Ornithology, a genus of birds of the order Grallae, of which the generic character is; bill deprefed, fubulate, recurved, pointed, flexible at the tip; the feet are palmate, four-toed, the hind toe not connected, very short, and placed high up; the nostrils are narrow, pervious; the tongue is short. There are only three species.

*AVOCET; Scooping Avocet; called also in different parts of this country, butter-clip, scooper, yelper, crooked-bill, &c. This bird is variegated with white and black; the bill is three inches and a half long; irises hazel; crown black; a white spot behind and beneath the eyes; rect of the head, neck, back, exterior part of the wings, lesser quill-feathers, tail, and under part of the body, white; inner scapulars and greater quill-feathers without and at the tips black; legs blueish, and very long; membrane connecting the toes indented. It resides in the temperate parts of Europe, weighing thirteen ounces; and measuring, from the tip of the bill to the end of the tail, eighteen inches. It breeds in the fens of Lincolnshire, and on Romney Marsh, in Kent. The female lays two white eggs, tinged with green, and marked with large black spots. In winter these birds assemble in small flocks of six or seven, and frequent the shores, particularly the mouths of large rivers, in search of worms and marine infests, which they scoop out of the mud or sand. They seem to be particularly fond of the cancer, pales, or loceats. By means of their long legs, they run over shores that are covered five or six inches with water. In their movements they are lively, alert, volatile, and difficult to catch. When the female is frightened off her nest she counterfeits lameness; and when a flock is disturbed, they fly with their necks stretched out, and their legs extended behind, over the head of the spectator, making a shrill noise, and uttering a yelping cry of trit, trit, all the time.

AMERICAN; American Avocet. The head and neck are reddish; back black, beneath it is white. It inhabits North America and New Holland; is fourteen inches long. Bill black; front dusky-white; neck above white; primary and tertial wing-coverts black, the middle ones, and some of the secondary quill-feathers, white.

ALA; White Avocet. This species is white; the lower wing-coverts brownish; bill orange; legs brown. Inhabits Hudson's Bay; fourteen inches and a quarter long. Bill tip with black; edge of the wings, greater quill-feathers, and tail, tinged with yellowish.

RECUSSANTS, in a general sense, persons, whether Papists or others, who refuse to go to church and to worship God after the manner of the church of England. Popish recusants are Papists, who so-refuse; and a popish recusant convict is a Papist legally convicted of such offence. See Papist, Prelumire, and Toleration.

RECUSSION, RECUSSION, an act by which a judge is directed to refrain from judging some certain cause, on account of his relation to one of the parties; or of some capital enmity, or the like.

By the French laws, kindship within the fourth degree is deemed a legal cause of recusation; as also the judge's being godfather, &c. of one of the parties.

By the laws of England also, in the times of Bracton and Fleta, a judge might be refused for good cause; but now the law is otherwise, and it is held that judges or justices cannot be challenged. Co. Litt. 254. See CHALLENGE.

RED, in Physics, one of the simple or primary colours of natural bodies, or rather of the rays of light.

The red rays are those which are of all rays the least refrangible; hence, as Sir Isaac Newton fupposes the different degrees of refrangibility to arise from the different magnitudes of the luminous particles of which the rays consist, the red rays, or red light, is concluded to be that which consists of the largest particles. See COLOUR, LIGHT, and RAY.

Authors differ in the three general kinds of red; one bordering on the blue, as cobaltine, or dove-colour, purple, and crimson; another bordering on yellow, as flame-colour and orange; and between these extremes is a medium, partaking neither of the one nor the other, which is what we properly call red.

Acids generally turn black blue, and violet into red; and red into yellow, and yellow into a very pale yellow.

Alkalies change red into violet, or purple; and yellow into feuillemort, or dead leaf-colour.

Terrestrial and sulphuraceous matters become red by extreme heat; and one, at length, black, as we see in brick, red oak, red chalk, flate, &c. All these, when vitrified by a burning glafs, become black.

Lobsters become red by a moderate fire; and by a violent one, black. Mercury and sulphur mixed and heated over a moderate fire make a beautiful red, called artificial cinnabar.

An acid spirit, as lemon juice, being poured on a blue solution of turpentine, turns it into a beautiful red. Alkali restores it again to its original blue. Filtrating of some reddish wines takes from them all their red colour.

M. De la Hire observes, that a very luminous body viewed through a black one, always appears red; as when the sun is seen shining through a black cloud. He adds, that some people who see all the other colours perfectly well, yet have no idea of red, and only see it as black.

RED, in Cosmetics, a fucus or paint with which the ladies enliven their cheeks and lips.

There
There are two kinds of reds; the one in leaves, called Spanish red; the other a liquor, which is an extract of a scarlet dye.

Red, in Dyeing, is one of the five simples or mother colours of the dyers. Some reckon seven kinds, or calls of red: viz. scarlet-red, crimson-red, madder-red, half-grain-red, half-crimson-red, lively orange-red, and scarlet of cochineal. But they may be all reduced to three, according to the three principal drugs which give the colours; which are kermes, cochineal, and madder.

The fine scarlet, called scarlet of the Gobelins, is given with agaric, bran-water, woad, and scarlet grain, or kermes. Some dyers add cochineal, and others fenugreek; brightening it with bran-water, agaric, tartar, and turmeric. See Kermes and Scarlet.

Crimson-red is dyed with bran-water, tartar, and mellelique cochineal. See Crimson.

Madder-red is dyed with madder; to which some add realgar, or red arsenic; others, common salt, or other salts, with wheat-flour; or agaric with spirit of wine, with galls or turmeric. See Madder.

The half-grain is made with agaric and bran-water, half scarlet grain, half madder, and sometimes turmeric.

The half-crimson is made of half madder, half cochineal. As to the lively orange-red, the stuff must be first put in yellow, then in a liquor made of goat's hair, (which has been boiled several times with madder,) diffused over the fire with certain saline liquors, as urine, tartar, &c.

The scarlet of cochineal, or Dutch scarlet, as the French call it, is made with flame, tartar, and cochineal; after first boiling it with alum, tartar, sal gemma, and aqua fortis in which pewter has been diffused.

Besides these seven reds, which are good and allowed colours, there is also a Drazil red; which is discouraged, as fading easily.

Of the seven good reds, only four have particular calls, or shades; the madder-red, crimson-red, lively orange-red, and scarlet of cochineal.

The calls or shades of crimson are flesh colour, peach colour, carnation rose colour, and apple-tree flower colour. Tho' of madder are flesh colour, onion-peel colour, and flame colour. Tho' of orange are the same with those of crimson. Scarlet, besides the shades of all the reds, has some peculiar to itself, as cherry colour, fire colour, &c. See Dyeing.

Red, in the Manufacture of Glass. See Red Glass.

To make a deep red in glass, the following method is that most practised by the glas-men. Take crytall frit twenty pounds, broken pieces of white glass one pound, calcined tin two pounds; mix these well together, and put them into a pot to melt and purify. When they are melted, take these, calcinations, scales of iron from the smith's anvil, both powders very fine, of each an equal quantity; put ideally an ounce of this mixed powder to the before mentioned metal; mix all well together, and let them stand fix or eight hours in fusion to incorporate; take out a proof after this, and if there be too little of the powder, it will appear of a dusky yellow; then more of the powder must be added, and then add three quarters of an ounce of calcined brasa, ground to a fine powder; mix them thoroughly together, and the mass will be of a blood red; continue fusing the whole together, and frequently taking out proofs of the colour, when it is right, work it immediately, otherwise it will lose its colour and become black. The mouth of the pot must in this process be left open, else the colour will be lost. Neri's Art. of Glass, p. 100.

Red, in Heraldry. See Gules.

Red, in Painting. For painting in oil colours they use a red called cinnamon, or vermilion; and another called lacca. See each in its place.

In liming and fresco, for a violet red, instead of lacca they use reddie, a natural earth found in England; for a brown red, they use burnt ochre, which is a native yellow earth, made red by calcination. It is chiefly brought from Oxfordshire; and burnt by those who prepare it in large ovens. The marks of its goodnese are brightness of colour, and a friable chalky texture, without manifesting any gritty roughness when rubbed between is fingers.

The common Indian red, which is of a hue verging to the scarlet, is much used, on account of its flattening and warm though not bright colour, in finer as well as coarser paintings in oil. It may be prepared by taking of the caput mortuum or ochre left in the iron pots after the distillation of aqua fortis from nitre and vitriol, two parts; and of the caput mortuum or coloquhar left in the long necks after the distillation of oil of vitriol, one part; breaking the lumps found among them, and putting them into tubs with a good quantity of water; and having left them to stand for a day or two, frequently stiring them, then lading off as much water as can be obtained clear from them, and adding a fresh quantity, repeating the same treatment till all the fat be washed out, and the water comes off nearly infusid. The red powder which remains must then be washed over, and, being freed from the water, laid out to dry. When this is designed for nicer purposes, it should again be washed over in basons.

The true Indian red is a native ochreous earth of a purple colour, brought from the island of Otrum, in the Perican gulf; and called, among the authors on these subjects, terra Perica. At present, it is very rarely to be found; but it is certainly very valuable (there being no other uncompounded purple colour in use with oil) as well for the force of its effect, as for the certainty of its spreading. In its genuine state, it needs no other preparation than grinding or washing over. It may be easily distinguished from any fictitious kind, by its being more bright than any other ochre which may be made up; and if it be rendered artificially purple by any addition, the fire will soon betray it; into which the genuine may be put without any hazard of change.

Venetian red is a native red ochre (see Veneta bolus), not much different from the common Indian red, but fouler; and may be easily prepared, by mixing common red ochre with the coloquhar or caput mortuum taken out of the aqua fortis pots, and washed over. As it is generally used by the house painters in imitation of mahogany, it requires no other preparation than to be well ground with the oil with which it is used; but when it is used in miniature painting, it should be carefully washed over.

Red, Blown, in the Porcelain Manufacture, a name given to a peculiarly coloured china ware, of a spangled red, or to the colour alone that spangles it. It is an ornament easily introduced into use in our own manufactories of porcelain ware; and is done in the following manner. The colour is to be prepared of common copperas, calcined to a red colour in a charcoal fire, in a crucible, with another heated on the top of it inverted, and with a hole in its bottom. The signal of the calcination being finisht, is, when the black clouds cease to come up through the hole, and a fine white thin vapour rises in their place. The vessels are to be then suffered to cool, and the red matter in them be to be reduced to a fine powder, while the vessels be to be coloured with this
are yet wet. The operator is to provide a glass pipe, and covering one end of it with a piece of fine gauze, he is to dip this into the powder, and taking it carefully out, with what little is sticking to it, he is to blow against the vessel at some distance from it; thus the finest part of the powder only will reach the vessel, and will be laid on in form of glittering spangles, very small, but all distinct. This is a

fort of colouring much esteemed by the Chinese themselves, and they have a way of using the common blue in the same manner; but few of the vessels thus painted come over to us.

RED Clover, in Agriculture, an useful artificial grafs for arable lands. It has this name in contradistinction to the white and some other forts. There were at first many and very great prejudices against and objections made to the introduction of this plant into cultivation by farmers, which were not surmounted without difficulty, and it prevailed for some length of time in particular districts, as Staffordshire and Worcestershire, before it was known in some other counties, where it is now very predominant and beneficial, as Cheshire, Lancashire, and many more.

In some arable counties red clover is found to fail as a crop when long cultivated, dying away in the winter and spring, which the farmers designate by saying that the land is sick of it. This is a severe inconvenience to them in many cases; and renders such variations in the courses of cropping necessary, as may prevent the recurrence of it so frequently as has hitherto been the case. It is very liable to fail in every part of the county of Essex, but of the cause of which there are different opinions, some think that the land becomes sick of the plant, while others do not ascribe it to any fatuity of this nature, but attribute their modes of cropping that it may not take place so often. About the Belcamps and Booley this is very much the case, some venturing it only once in seven years, and in that case it succeds well. In all the Tendring hundred it is found to decline little on the strong rich lands, but is felt on the lighter forts; on both the cropping is varied in regard to it. In the neighbourhood of Thorndon the lands are sick of it. And at Audley End the land is tired of it, but more in many cases from want of sufficient feed than any thing else. In the vicinity of Hal-lingbury it is very liable to fail, if sown oftener than once in seven or nine years, though theylem thereabouts is crop and fallow.

In the county of Oxford some low red clover twice in ten years, the land being new to it; of course it never fails. On the gravelly loamy soils about Henly it dies from repetition, so that it is alternately omitted in cropping, others being substituted, as white clover, trefoil, and peas. Nothing of this fort was known forty years ago, but now they sow it only once in two rounds. The loams and feme-brash lands around Wood Raton are not in general tired of this plant; some however find it to fail on the latter fort of soil. About Great Tew, where the lands have been inclosed forty years, they are not yet tired of red clover. At Atterbury, where the lands have been inclosed many years, it does not now succeed quite so well as it did fifteen or twenty years ago. In these cases other crops are put in, as tares and early peas drilled.

Some suspect sheep’s dung to be destructive to the red-clover plant, but there are no proofs of the fact.

The most proper management of red clover as a preparation for wheat is a matter of great importance. Some think feeding it off wholly the beast practice; others mowing and feeding; and a few mowing altogether. The method of feeding off the crops altogether, when done in a close manner, is probably the most advantageous in this intention, though there may be some immediate losses and inconvenience; after which that of mowing the first crop and feeding the second in a suitable manner; the third mode, or that of mowing twice, is most to be feared, but upon some forts of land it may be done and answer well for wheat. These methods are all practised and have their advocates in different parts of Essex; and some think that they get as good wheat after white as red clover, as well as that feeding the latter does no injury in this respect.

The farmers in Oxfordshire follow nearly the same practices, and hold much the same opinions in regard to the management of this crop as a preparation for wheat. And the custom of mowing and feeding off the first year, is thought the best practice in some other counties.

But in the county of Lancashire, and some others adjoining it, they know nothing of the land being ever sick or tired of this fort of crop, though they grow it in more frequent succession and in a more full manner than perhaps any where else in the kingdom. Ask the farmers about this, and you will find from one end of the above county to the other, they are all of the same opinion, and appear much surprized at the question, not ever having any conception of such a circumstance. What can be the reason that red clover has been as long and as frequently cultivated in these districts, as in those where it is so liable to fail? Does it depend upon the difference in the nature or quality of the soils, or the management in regard to the quantity of feed and other matters? The circumstance is worthy of further and more close attention and investigation, in consequence of its great importance to the farmer.

There is one particular feature of management in the cultivation of red clover in the county of Oxford, which is that of hand-howing over it from fourteen to fifteen bushels of Newbury peat-ales, that are brought into the Thames, by the Reading canal, on the acre, about the end of March or at the beginning of the following month; which has an immediate effect upon it, seldom failing to produce a crop, except where it naturally declines. The expense is estimated at about ten shillings the acre. These ales do not, however, seem to be employed in this way to the red clover crop in the district where they are found and prepared.

Seeded red clover undergoes two succellive threplings, the first, which only beats off the heads and chaffs containing the feed from the stalks, is called cobbing in some places; the parts thus separated being denominated the red-clover cobh. The work is performed on a thick wooden plank frame for the purpose, and requires much labour to separate the feed, which, when done, is cleaned and passed through different sieves, being ultimately divided into two forts, the primary and secondary. The cost of these operations is very great, amounting to from four to six shillings the bushel, and sometimes much more. It has been concluded by Mr. Middleton, that this plant grows a full crop in all the arable lands of this country, from the sands of Norfolk to the cliffs of Cleveland and Suff. And that various soils that have been exhausted by corn, and not much accustomed to red clover, have been so much restored by it, as to produce a good crop of wheat; but that to do this every means should be used to secure a full crop, as that is an excellent preparation for corn, and seldom fails of ensuring a considerable produce, arising from shade, smoother, and putrefaction, the natural and constant attendants of full-grown red clover. It is supposed advisable, in some cases of poor land, to feed both crops off on the land by sheep and other animals, in some way or other. And sometimes to sow the first and feed the second, or the contrary. In every point of view this is an interesting plant to the farmer. See Clover.
Red Gun, an insect disease on wheat, by which the ears of the grain are deprived of their nutrition, and thereby prevented from perfecting themselves. It is described by Mr. Middleton to be a collection of insects, which are visible to the unaided eye, and which, in the early part of their growth, are of a reddish colour, but become brown with age: the black spots on the straw, blades, and ears of the wheat, are supposed to be the excrement of the insects. The blighted ears are probably rendered so, by the insects piercing the necks of the straw immediately below them, and sucking the saccharine juice, otherwise designed for filling the corn. In those ears which have both perfect and imperfect grains, the insect has perhaps infected its probe at the connection between the corn and the straw, and by drinking up the food of the grains severally, has flamey many of them in such a manner as to cause their destruction and decay. The exact nature of the disease is not, however, yet well ascertained.

Red Hay, a term used to signify such as is mow-burnt, in opposition to such as is green from a moderate heat, and winny hay, or such as is mouldy.

Red Land, a term used by husbandmen to express a sandy soil of a reddish hue, interpenetrated for the most part with pieces of sand-toned of the same colour, or somewhat deeper.

It may be noticed that there are several varieties of this soil: one of which is almost entirely made up of sand; another with an admixture of loam with the sand, the whole making a loose loamy earth; and a third full of fragments of a poor sandy iron ore, and often containing flaking specular of felnite. See Soil.

In some of the more northern parts of the county of Oxford, there is a rich red sandy loam, upon a red grit-toned rock. In some places this land is of more sandy quality than in others; and, in particular instances, a deep red loam, or red clay. The lands are moist of an excellent quality, both for arable purposes and those of grass; but the sandy forts are better than those of the clayey kinds, especially for the former use. The red soils in this district are considered as the boast and glory of the county, as they are deep, found, friable, and yet capable of tenacity; being well suited to almost every sort of plant which can be truffed to them, in the way of cultivation. Soils of this nature prevail more or less in a vast number of counties throughout the kingdom, even from the more southern ones to those far advanced towards the north.

Red Room, a term signifying the red tinge in ripening barley, and sometimes other sorts of grain.

Red Row, a provincial term, applied to the grains of barley, when in a ripening state, or flecked with red. The crop is then said to be in the red row.

Red Antimony, in Mineralogy, an ore of that mineral, of a cherry-red colour, containing, according to Klaproth, 67.5 antimony, 10.8 oxygen, 19.7 sulphur.

It occurs most frequently in minute diverging capillary crystals. It melts and evaporates before the blowpipe, yielding a fulphurous odour. See Antimony.

Red Arsenic. See Arsenic.

Red Chalk. See Reddish, and Ores of Iron.

Red Cobalt, called cobalt crust, and cobalt bloom or ochre, an ore of cobalt, of a peach blossum red colour. See Cobalt.

Red Copper, Ruby copper, an ore of copper, of a cochineal red colour, inclining to a lead-grey. It consists, according to Klaproth, of 91 parts copper and 9 of oxygen. See Copper.

Red Hamalite, Fer oligile facutrenierie of Haüy, an ore of iron, found in kidney-shaped and globular balls. The structure is fibrous, and divergingly radiated, but arranged in concentric curves; the colour is a bluish-grey, intermixed with red. By friction, it acquires a high metallic lustre. It yields from 65 to 70 per cent. of pure iron. (See Iron.) An excellent ore of this kind is procured near Ulverstone, in the north of Lancashire, much valued, as producing an iron of a peculiarly ductile quality, suited for the purposes of the wire-drawers.

Red Lead. See Minium and Lead.

Red Scalpy Iron Ore. Fer oligile flagrant of Haüy. It consists of feally particles slightly cohering; it has an unctuous feel, and flains the fingers. It passes into micaeous iron ore.

Red Schorl. See Ores of Titanium.

Red, or Ruby Silver Ore, Argent antimoniacal sulphure of Haüy. Werner divides this into two sub-species, dark red silver ore, and light red silver ore, distinguished from each other by their colour, and the situations in which they occur. The dark red ore is commonly accompanied by galena, antimonial sulphuret of silver, quartz, calcaceous spar, and pyrites. The colour is between cochineal red and lead-grey. It occurs massive, disintegrated, and crystallized in equiangular six-sided prisms, frequently variously truncated. The form of the primitive crystal is an obtuse rhomboid, whose pole angles are 105° 28' and 75° 32'; the inclination of the faces 105° 28' and 75° 32'. The external luster is pellucid, and in some specimens metallic; internally it is shining, and sometimes semi-metallic and metallic. The fracture is uneven, and in the crystallized varieties imperfectly smooth conchoidal. See Ores of Silver.

The massive varieties are opaque; the crystallized, semi-pellucid and pellucid. The colour of the flesh is a cochineal red. This variety yields easily to the knife; before the blowpipe or charcoal it deceripates, and melts with a slight effervescence, emitting a dense smoke, which colours the charcoal yellow, and leaves a globule of silver. The specific gravity is 7.65 to 5.68.

The light red silver ore is usually accompanied by native arsenic, white cobalt ore, orpiment, and sulphate of barytes. The colour passes from a carmine red to a medium between cochineal red and lead-grey. In most of its characters it agrees nearly with the dark red silver ore; but when fused, it yields an arsienie vapour. Hence some chemists have conjectured that this ore differs from the dark red ore, by the former containing antimony, and the latter arsenic. According to Klaproth, red silver ore contains nearly 60 of silver, 10.5 sulphur, Combined with 29.4 of antimonial kines, 3.2 oxygen, or 5.9 sulphur.

A variety of red silver ore, probably the light red ore of Werner, analyzed by Prout, gave 74 sulphuret of silver, 25 sulphuret of arsene, .6 oxyd of iron.

Red silver ore may be distinguished from cinnabar and red copper ore, by its specific gravity, which is considerably less than the former, and greater than the latter; the specific gravity of red silver ore being 5.6 to 5.8. of cinnabar 7 to 7.5.

Red Copper 3.9.

Red Vitriol, a salt found at Neufohl, in Hungary, in the form
form of transparent crystals of a pale rose-red colour, and more or less transparent. It was discovered by Klaproth to be a sulphate of cobalt. Its solution affords a pale blue precipitate, with carbonate of potash, which tinges borax a pure blue colour.

Red Berr, in Ichthyology. See Charr.

Red Eye, Erythroptalbus, the cyprinus erythroptalbus of Linnaeus, called by some robaus, or rooang, which, in the German language, signifies the lime. It very much resembles the common river bream in shape, but that it is somewhat thicker. The fins are all red, and the whole body of the fish is lined with a very elegant red, but no part of it so much as the iris of the eyes. When the scales are off, the body is of a greenish hue, and it has a yellow spot under the tongue. It much resembles the river mullet in some particulars, but it is of a more beautiful colour, and its eyes are more red. Its largest size feems a foot in length. It is a well-tasted fish; and spawns in April, under cover of the roots of trees. Ray.

This fish is called rudd by some English authors; it is also called ruilus later, rubello flavilletis, and is found very common in many of the rivers of Germany and England, and is in season all the year, except in spawning time, when the male is subject to a great number of white spots on its head, and is more rough than at any other season. Willughby. See cyprinus erythroptalbus.

Red-Breast, in Ornithology, a well-known bird, for the characters of which, see Motacilla Rubecula.

The song of this bird is remarkably fine and soft, and continues through the greatest part of the winter, spring, and summer. Many of the autumnal flogers seem to be the young cock red-breasts of that year. Pennant.

Thompson, in his Scephus, Winter, line 246, has admirably described the annual visits of this guest; and the ancient ballad of "The Babes in the Wood," recording the affection of this bird for mankind, is universally known.

Red Chatterer of Latham, Red-bird from Surinam of Edwards, and Ampelis cornix of Gmelin, a bird of red colours, with an ocular band, and the wing and tail-feathers black at their tips. It is found in New Spain, Guiana, and Surinam.

Red Game, an English name of a bird, common in the mountainous parts of Yorkshire, and some other of our northern counties. See Gorr-cok, Grouse, and Tetrao Lagopus.

Red-Pole, or Linnet. See Fringilla and Linnet.

Red-Pole, Tellow, or Red-headed Warbler. See Motacilla Pechlea.

Red-Head, the name of a water bird, called by authors gallinula erythroptalbus, and calidris; the ilopex calidris of Linnaeus. It is about the size of the common plover. The back is of a greyish or brownish-green, usually spotted with black; its neck grey, and its throat variegated with black and white; the breast is white, with a few loof streaks of black; the wing-feathers are variegated with black, brown, and white; the bill is two fingers breadth long, slender, and shaped like the beak of the woodcock; reddish at the base, and blackish lower down; its legs are of a nice beautiful red, and the hinder toe is very short and small. It breeds in the fens and marshes; is found on mole of our shores; conceals itself in winter in the gutters; and is generally found single, or at most in pairs. When disturbed it flies round its nest, making a noise like a lapwing. It lays four eggs, of a whitish colour tinged with olive, and marked with irregular spots of black, chiefly on the thicker end. Ray and Pennant. See Sclophax.

Red-Star, the English name of the rutilus, or motacilla phoeniceus of Linnaeus, a very beautiful bird. The bill and legs of the male are black; the forehead white; the crown of the head, hind part of the neck, and the back, are of a deep blue-grey; the cheeks and throat black; the breast, rump, and sides, are red; the two middle feathers of the tail brown, the others red; the wings brown. In the female, the top of the head and back are of a deep ash colour; the rump and tail of a duller red than those of the male; the chin white; the lower side of the neck cinereum; and the breast of a paler red.

This bird appears among us only in the spring and summer, and is observed to come over nearly at the same time with the nightingale. It is so shy, that it will forsake its nest, formed with moss on the outside, and hair and feathers within, in hollow trees and the holes of buildings, if the eggs are only touched. It has a very fine soft note; and is remarkable for shaking its tail, and moving it horizontally, as a dog does when baying. Pennant.

Red-Star, Greater. See Lanius Inflatus. See also Turdus Saxatilis.

Red-Star, Indian or Bengal. See Lanius Emuria.

Red-Star, Small American. See Muscicapta Rusticilla.

Red-Star, Grey. See Motacilla Gibratariensis and Erithacus.

Red-Stone Pcll. See Linnet.

Red-Tail. See Motacilla Erithacus and Guianenfts.


Red-Wing, the name of a bird of the turdus, or thrush kind, called also in some places the wind thrush, or fauine pipe; and by Linnaeus and others the turdus iliacus, or thus.

It is a little smaller than the common thrush, and is left spotted. Its back, neck, and head, are of the same colour with those of the common thrush; but its sides under the wings, and the feathers which line the wings, are of an orange colour, or dusky red; its belly and breast are white, and its throat yellowish, with brown spots: the wings are of a sort of chestnut colour, a little variegated. It feeds on insects, as worms, and the like; and is a bird of passage, coming to us in large flocks about the same time with the fieldfare, and leaving us also when that bird does. When the red-wing appears on the coast in autumn, it is certain the woodcocks are near. It is not well known where they breed, though some have guessed it to be in the mountains of Germany and Bohemia. They have a bitterish taste, and are less valued than the fieldfare. With us they have a disagreeable piping note; but in Sweden, during the spring, they sing very finely, perching on the top of fome tree among the feres of maples. They nest in hedges, and lay fix blueish-green eggs spotted with black. Ray and Pennant.

Red Water, a disease in sheep. It has been supposed by farmers to be caused by taking too much watery food, such as turnips, clover, rape, eddie, &c., but it is not peculiar to sheep feeding on turnips or rape, as has been believed by some. Its removal has been attempted by the use of common salt, a tea-spoonful of a tincture of vitriol, and the frequent driving the animal about; and it is ascertained, that the disease may be wholly prevented by having recourse to the use of dry food, in the night time, while the sheep are feeding upon these juicy kinds of food. See Sheep.

In Suffolk the sheep are sometimes affected with this complaint on their being first turned into turnips, which is supposed to be caused by their eating too large a portion of them in wet weather. The disease is also believed to originate in the sheep being let out of the fold, when the ground
is covered with hoar frost; and often from feeding in the oat-erfhes about the beginning of the autumn, when the young oats are strong. It is thought here to be readily obviated by allowing a small quantity of hay fo as to counteract the great waterinfs of the turnip; the quantity of half a pound or even less in the course of the day is believed to be quite enough for each sheep in this intention. It is likewise suspected, that clover, flubble, and folded land, are productive of it in wet weather or moist feasons.

Red Weed, in Botany, a name given to a plant common in the Bermudas, and some other places; and called by our first travellers to that part of the world, the Summer Island red weed. Its berry is of a fine red colour, and affords a tincture little inferior to that of cochineal, and possifling all its virtues in medicine: the only misfortune of this, and some other very fine vegetable colours, is, that they fade soon. The juice of the fruit of the opuntia, or prickly pear, is as fine a dye as can be procured from the cochineal, but it will not fland; the infect feeding on this, however, we find affords a colour of the fame nature that will fland. The fruit of the wild weed is in the fame manner liable to be eaten by insects as that of the prickly pear; and it is worthy a trial, whether the colour obtained at second hand from insects, will not fland as well as the cochineal does, and whether the insects may not be propagated in a fufficient abundance to serve the markets in the fame manner. Phil. Tranf. No. 40.

Red Weed is also a provincial term, signifying the round smooth-headed poppy, a pernicious weed in corn-fields. See Weeds.

Red Worm, in Natural History, the name of an infect very deftuctive to young corn crops. The following defcription of this worm has been given by Mr. W. Baker: after observing, that he has often heard of the havoc which red worms make in young wheat, barley, and oats; and in some few writers upon husbandry has read of them, but never saw them till May 1764; when, to his great mortification, in a few days they defroyed almost totally nine acres of his wheat, for he did not reap above half a barrel per acre; and that the ingenious M. de Chataeuix fpeaks of an infect, which is certainly of the fame kind, if it be not the very infect which he has now under confideration; and in noticing the infts fultained in wheat crops, fays, they found in it many little white worms, which afterwards became of a chefnut colour. They poifon themselves between the blades, and eat the fins. They are ufually found between the firft joint and the roots; every infall which they attacked grew no more, but became yellow and withered. And the fame mortification happened to them in the year 1752. The infts appeared about the middle of May, and made fuch havoc, that the crops were almost defroyed; Stillingfleet, alfo, in the fecond edition of his Miscellaneous Tracts, fpeaks of an infect, which is probably the fame as in Suffolk and in fome parts of Norfolk, where the farmers find it their interest to encourage the breed of rooks, as the only means to free their grounds from the grub, from which the trees or blind-bectle comes, and which in its grub flate defroyes the roots of corn and grafs to fuch a degree, that he has seen a piece of pature land where you might turn up the turf with your feet: he adds, that Mr. Matthews, a very obferving and excellent farmer of Wargrofe, in Berkshire, told him, that the rooks one year, whilst his men were hewing a turnip field, fat down in a part of it, where they were not at work, and that the crop was very fine in that part, whereas in the other part there were no turnips that year; though M. de Chataeuix defcribes this worm as being firft white, and afterwards be-

coming of a chefnut colour, he has carefully fought them at different periods during the past year, but always found them of the fame chefnut colour, never varying in any particuar except that of fize, which he finds to be the cafe at all feasons in which he has seen them; and he obferves, that the infect fpeaks of by Stillingfleet as a grub, which, he fays, defroyes corn and grafs, induces him to believe that it is the fame infect (though the report which he relates from Mr. Matthews seems to contradift it), because he has obferved that the red or chefnut worm never appears voluntarily upon the surface; but when the earth is turned up, either with plough or fpade, the rooks or crows are very bold in their approach to pick them up, a circumstance which, he owns, has in fome degree abated his caution to these birds; he therefore never defroyes or frightens them off his land whilst he is ploughing it; but when he fows, when the corn fires, and when it is ripe, he defroyes or banifhes them as well as he can, because the miftich which they do at these times is intolerable; he has also obferved his lucern to decay in its tops foon after it has been up; and upon examining the roots he has found the red worm which had eat them off; and that, in fuch, this infect seems to be the moft deftuctive. Mr. Needham, in his Difccrptions of the English writers, who have fpeaken of the infect which defroyes the corn in the manner already mentioned, which he thinks undoubtedly the fame, it is called a grub, by others the large maggot, and the rook worm, becaufe the rooks eat it.

These worms are about half an inch long, and about one-tenth of an inch in diameter; they are jointed in their fkins, and are of a very firm texture; they have many short legs, two small black specks, which appear to be their eyes; and two small points springing from their heads, with which, he believes, they eat the corn, and which in that work, he apprehends, act like forceps; and all that he has feen of this species are of a bright chefnut colour. For this reafon, he fhould conceive it would be more defcriptive to call them the chefnut-worms. When they are expofed to the air, by turning up earth which is infetted with them, they will very foon cover themfelves again in the foil, which they are very capable of doing by the strength which their make gives them, although they appear to be a fuggifh infect, and have not the advantage of a fliynefs upon their fkins, which the common large creeping worm has, which enables that inoffenfive worm to penetrate the earth, and get under timber and Bones with ease. The red worm, immediately endeavouring to cover itfelf from the air, is certainly, he thinks, from natural inftinct, as it will foon die when expofed to the air, as will appear by the experiment, No. 10, mentioned below.

It is further flated, that these worms defroy wheat, barley, oats, and lucern, while in an infant flate, in the months of March, April, and May. Late fown barley and oats they will defroy as late as June. He has not yet experienced that they defroy any other crops. The miftich done by them is in dry weather. Rain fufficient to penetrate the ground makes them deffift from defroying the corn; and he fuppofes every thing else which they at any time injure. They eat wheat off just above the crown of the roots; barley and oats in the fame place, and also higher up, upon any part of the flem which is below the surface of the earth. And these worms feem to abound more in ground which is lightly tilled, than in fuch as hath been well tilled; but in lay ground they feem to be more numerous than any where elfe: and the fields upon his farm in which he has found them, are wetter than other fields where they are not; whether that circumftance contributes to their increafe, he cannot fay; but the fol-

following
lowing experiments prove that they will live longer in water than they can when exposed to the open air.

Experiments.

No 1. He put ten red worms into a wine glass with common salt in it. They were all dead in four hours.

No 2. Into a glass with brine in it he put ten red worms. They were all dead in six hours.

No 3. Into a glass with lime in it, which had been flaked for a long time, and exposed to the weather, he put the like number. They were all dead in forty-four hours.

No 4. Into a glass with the above lime, and some water in it, he put the like number. They were dead in twenty hours.

No 5. Into a glass with lime newly flaked, and when cold, he put the like number. They were dead in fourteen hours.

No 6. Into lime water, made with cold water, he put the like number. They were dead in ten hours.

No 7. Into a glass with foot in it, he put the like number. They were dead in four hours.

No 8. Into foot and water he put the like number. They were dead in four hours.

No 9. Into pure water he put the like number. They were dead in fifty-two hours.

No 10. Into a glass, without any thing in it, he put the like number. They were dead in thirty-two hours.

It is stated that by these experiments it is seen that all the articles used will kill this insect in a short time, particularly the salt and foot. He thought it necessary to consider different articles, the better to suit different parts of the kingdom.

Where lime can be conveniently had, and that it is used as a manure, he is apt to believe, from the experiments, that no injury can be sustained from these worms; but he is afraid a small quantity will not effectually destroy them; besides, he should fear, if it were not put on before the sowing of the corn, that it might mingle the blades of the corn; for, from these experiments, it appears that lime newly flaked is more suddenly destructive to them than old lime, and therefore it is to be preferred.

Where lime is used for no other purpose than to destroy this worm, he should conceive, that about eight barrels, regularly sown by hand on an acre of ground, might be sufficient: it must be first flaked and cold before a man can possibly cast it upon the ground with his hand, lime being a very strong caustic; and even when it is cold the man should have a thick glove upon his hand.

Where salt may be used to destroy this worm, it must also be sown upon the ground before the intended crop; for although corn will not vegetate, and receive benefit from salt as a manure, when it is used antecedent to the sowing of the corn, yet if it be added after the corn is growing it will certainly destroy it: therefore it should never be used for this purpose, but before the corn is sown, or at least before it vegetates.

He conceives that where salt is used for this purpose only, about four hundred and a half to an acre will answer the purpose, which is a little more than one ounce to every square yard.

It is seen by the experiments, that foot kills this worm as soon as salt; and as in most places it is to be had at a much less price than salt, he thinks there can be no doubt about preferring it; besides which, it may be safely used after the corn is up.

He had some small parcels of barley under experiments, which these worms began to destroy; and in order to convey the foot as soon as possible to the roots of the plants, he mixed a little of it in water, and poured it on the plants with a garden watering-pot: the consequence was that he did not lose one plant afterwards.

It will hardly be imagined that he means that the same method is to be pursued upon a whole farm: no; the method he would recommend to the practice of the farmer is this; to spread, or cast by hand, as he fosws his corn, about fix or eight barrels of foot on an acre, and let him be careful to choose a calm day for the work, otherwise the wind will carry away a great part of it; and as what remains cannot be regularly dispersed, let him be careful to do it early enough in the spring, that the rain may wash in the foot and convey it to the roots of the plants before the worm begins its mischief; if he does this, he is perfuaded his crop will be preferred.

It is found by the experiments, that these worms will live longer in water, by twenty hours, than when exposed to the open air; but at length, that is in fifty-two hours, they died in the water; perhaps this might be from the effect of drowning; but if so, he might have expected they would have been totally destroyed in his two fields in the winter of 1763 and 1764, by the immediate rains which fell at that season for a long continuance, which often flooded the lands. But they survived that winter, as appeared by the great loss he afterwards sustained by their destroying his wheat; and therefore, whether water be an enemy to them or not, it seems not easy to determine; but if those which died in the glasses of water were really drowned, he thinks we may conclude that water is necessary to their existence in the earth, and probably aids them in getting their food from it: and what seems to confirm this notion is, that when the land is wet, they do not touch the corn, but as soon as ever the land is dry, they begin their mischief. However, this speculation he must submit to the consideration of persons more capable of discovering it than he is.

It is seen by experiment No 10, that they cannot live in the open air, which seems to prove, that, where they abound in land, the oftener it is ploughed, particularly in the summer, when they cannot penetrate the ground so easily as when it is moist, they must be, by such ploughing, greatly diminished; besides which, the frequent ploughing gives the cows more opportunities of picking them up, in which, as he has before said, they are very watchful.

Frequent ploughing has been recommended by some writers as the only means of destroying this worm; and they have recommended the ploughing be stuck with nails, urging, that by those nails the worms are cut to pieces; others have recommended walnut leaves being soaked in water, to sprinkle the land, and strewing dead corn in various liquors, as infallible remedies; but such methods as these are founded upon mistaken principles; they only mislead the farmer, and must disappoint him.

Worldly recommends a strong ley made of fixed salts, but that would be impracticable. Mortimer recommends sea-water, which he believes would answer very well. He says, he used foot once with success, but that it did not succeed with him afterwards. Mr. Baker is persuaded he did not use the foot early enough to have it washed into the ground by rain, or perhaps he used too small a quantity. He concludes by observing, that he would not be thought to arrogate any merit to himself, on account of what he has here offered on this subject, since it appears that other persons have used the articles which he has recommended, against this common enemy; but many persons have been disappointed in their expectations from these remedies,
remedies, which must have arisen, he thinks, from their either having used too small a quantity, or not having observed the necessary precautions; if those which he has recommended shall be put in practice and found to answer, he shall think himself amply rewarded.

This worm undoubtedly does great injury to grain crops in many cases, in particular soils and sorts of land; but a great number of additional facts and experiments are wanting to fully prove its nature, and the ways in which its destructive effects on such crops are produced, as well as the best, most ready, convenient, and effectual ways in which it can be destroyed. See Wire-Worm.

Red Deer, fibr. flar. floris. tartar. See the Substantives.

Red Ink. See Ink and Printing.

Red Notes, in old Mufe, before the invention of printing, were used for diminution. In the MS. at Paris of the Latin and French poems of Guillaume Machaut set to music, chiefly motets for a single voice, some are written in black and red notes, with this instruction to the fingers; "ni grae funt perfectae, et rubra imperfectae;" an admonition worth remembering by those who wish to decipher music of the fourteenth and fifteenth centuries, in which red notes frequently occur. It was an easy expedient of diminution till the invention of the press, when the use of different coloured inks on the same page occasioned the trouble and expense of double printing. See Machaut.

In the Papyri and Kylist at Cambridge, there are examples of the use of red notes for diminution in fragments of music by Joseph Gwine and Robert Davie, who flourished in the time of Edward IV. Morley has given some examples of the use of red notes in his annotations.

Red Banks, in Geography, a part of the United States, on the S.E. side of Delaware river, in the town of Woodbury, Gloucester county, New Jersey; seven miles S. of Philadelphia.

Red Bay, a bay on the N. coast of Spitzbergen. N. lat. 79° 44'. E. long. 10° 42'.—Alfo, a bay on the S.E. coast of Labrador. N. lat. 51° 50'. W. long. 60° 10'.—Alfo, a bay on the N. part of Buffalo’s bay, on the S. coast of Massachusetts, in America.

Red Crab Island, a small island in the East Indian sea, near the coast of Arracan. N. lat. 21° 30'. E. long. 91° 50'.

Red Deer Lake, a lake of North America. N. lat. 55° 10'. W. long. 112°.

Red Flagg Bay, a bay on the N. coast of the island of St. Christopher, E. of Ragged Point.

Red Haven, a bay of Scotland, on the N. coast of the county of Banf; three miles E. of Cullen. N. lat. 57° 39'. W. long. 2° 38'.

Red Head, a cape of Scotland, on the E. coast of the county of Angus; six miles S. of Montrose. N. lat. 56° 33'. W. long. 2° 26'.—Alfo, the N. point of the island of Eda. N. lat. 59° 6'. W. long. 2° 40'.

Red Hills, rocks in the German sea, near the coast of Northumberland. N. lat. 55° 26'. W. long. 1° 17'.

Red Hook, a town of America, in the township of Rhy- nebeck, and Dutchess county, New York, on the E. bank of Hudson’s river; 21 miles S. of Hudson.

Red Horfe, Vale of, a district of England, in the county of Warwick, which owes its name to a horfe cut in a hill, the foil of which is reddish.

Red Island, an island near the E. coast of Labrador. N. lat. 43° 55'. W. long. 55° 30'.—Alfo, an island near the W. coast of Newfoundland. N. lat. 48° 35'. W. long. 59° 10'.

Red Lake, a comparatively small lake of North America, at the head of a branch of the Bourbon river, sometimes called "Red river;" its form is nearly round, and its extent is about 60 miles in circumference. It has on one side an island, close by which a river enters. It lies almost S.E. both from lake Winnepeck, and from the lake of the Woods. N. lat. 41° 5'. W. long. 94° 10'.—Alfo, a lake of North America, in N. lat. 47° 40'. W. long. 95° 15'.

Red Lick, a salt spring of the state of Kentucky; 32 miles E. of Stanford.

Red Point, a cape on the E. coast of New Holland. N. lat. 34° 29'. W. long. 208° 45'.

Red River, a river of Louisiana, which rises in about N. lat. 35°, and W. long. 96°, and runs into the Mississippi, N. lat. 37° 15'. W. long. 91° 48'.—Alfo, a river of Upper Canada, which runs into Lake Superior. N. lat. 47° 51'. W. long. 85° 46'.—Alfo, a river of Tennessee, which runs into Cumberland river, about two miles N.W. of Clarksville. N. lat. 36° 18'. W. long. 87° 46'.—Alfo, a river of Kentucky, which runs into Kentucky river, about nine miles above Boonsborough, N. lat. 37° 45'. W. long. 84° 18'. It is 60 yards wide at the mouth.—Alfo, a river of North America, which rises from Red lake, in N. lat. 47° 40', and runs into Winnipeg lake.—Alfo, a river of Canada, which runs into the Utwaas; 60 miles W. of Montreal. See and Mythotchees.

Red Sea, called by the ancients the "Arabian gulf," forms the grand natural division between Asia and Africa, and extends about 21° or 1470 British miles from the straits of Babelmandeb to Suez; it terminates in two branches, the western being extensive, and the eastern ascending a little beyond the parallel of mount Sinai.

This sea is called, in the Old Testament, the sea of Suph or Zuph, the sea of weeds, on account of the great quantity of algae and fucis, and perhaps the madreporas and coraline substances, anciently supposed to be of vegetable origin, found at its bottom, and near the shores. In scriptural language it is also denominated "the tongue of the Egyptian sea;" in the Greek and Latin geography, it was called the gulf of Heropolis; and by the Arabian geographers, the western arm of the sea of Kolzum, (al Kol- zum, with the article,) which seems to have some affinity with "Clifma," another name by which this gulf was formerly known; Kolzum in Arabic, and Clyfma in Greek, signifying destruétion, in reference, as it is supposed, to the destruétion of Pharaoh’s host. Don John de Castro, vice-roy of the Indies for the king of Portugal, conjectures that it was called the Red sea from the great quantity of coral that is found in it. Pliny says that it obtained this name, in Greek "Erythraea," from a king called Erythros, who reigned in Arabia, and whose tomb was seen in the island Tyrine or Agyris. Several learned men believe, that this king Erythros is no other than Eufau, or Edom; Edom, in Hebrew, signifying red or ruddy, as Erythros does in Greek. But Calmet is of opinion, that Edom never dwelt, either on the shore of the Red sea, or the Persian gulf, which has been sometimes also called the Red sea. His habituation was east of the land of Canaan, towards Bozra; and he inclines to believe, that the name of the Red sea was not given to this gulf till after the Idumeans, descended from Edom, had spread themselves from eait to west as far as the Red sea. At that time it might receive the name of the sea of Edom, which the Greeks rendered by the Red sea, or "thalassa erythrea."

The famous miracle of the passagle of the Red sea by 600,000 Israelites, besides old men, women, and children, recorded in the sacred writings, is well known. Those who have been defirous of explaining this passagle, without
out admitting the miraculous part of the history, have had recourse to a variety of conjectures; both as to the place and the manner in which this passage was effected. As to the place of the passage, there has been a difference of opinion even among those who have not hesitated to acknowledge that it was miraculous. Till of late years it has been generally believed, that the passage of the Israelites was at Baidah, or Bedea, which, according to Niebuhr, is about six German miles from Suez, and where the sea, says Bruce, is something less than four leagues broad, by 50 feet deep. In support of this hypothesis, Dr. Shaw has traced the march of the Israelites to their third encampment before Pihahriroth. Whilst they were removing from the edge of the wilderness of Etham towards this station, they had left the open country and were marching through a narrow path, between the mountains of Gewoubee and Attackah. In these circumstances the Egyptians might well imagine, that they could have no possible way of escape, as the mountains of Gewoubee would obstruct their prospects towards the south, and those of Attackah would impede their advancing towards the land of the Philistines; the Red sea lay before them to the east, whilst Pharaoh closed up the valley behind them, with his chariots and horses. This valley terminates at the sea, in a small bay, made by the eastern extremities of the mountains above-mentioned; and is called "Tiah Beni Isreal," i.e. the road of the Israelites, from a tradition still existing among the Arabs of their having passed through it; and it is also called "Baidah," from the new and unheard-of miracle that was wrought near it, by dividing the Red sea, and destroying it in it, Pharaoh, his chariots and his horses. The encampment of the Israelites, according to Dr. Shaw, was at this bay, before Pihahriroth, betwixt Migdol and the sea, over-again Baal-tzephon, Exod. xiv. 2. Baal-tzephon, as this learned geographer suggests, might have relation to the northern situation of the place itself, or to some watch-tower, or idol-temple that was erected upon it; or it may be taken for the extremity of the mountains of Suez, or Attackah, the most conspicuous of these defeats, as it overlooks a great part of the Lower Thebais, as well as the wilderness that reaches towards, or rather which makes part of, the land of the Philistines. Migdol might lie to the south, as Baal-tzephon did to the north of Pihahriroth. The marches of the Israelites, from the edge of the wilderness, being towards the sea, i.e. towards the S.E., their encampment betwixt Migdol and the sea, or before Migdol, could not well have any other situation. Pihahriroth, or the mouth of Hihroth, or a narrow gullet or defile, may denote the mouth, or the most advanced part of this valley towards the E., or towards the Red sea. But as the Israelites were delivered at this place from their captivity and fear of the Egyptians (Exod. xiv. 13.) we may suppose that Hihroth denotes the place where they gained their liberty, horizon and hiroth being words of the like import in the Chaldee. It may be further urged in favour of this explication, and also of the tradition still preserved, of the Israelites having passed through this valley, that the eastern extremity of the mountain, suppos'd to be Baal-tzephon, is called, even to this day, by the inhabitants of these deferts, "Jibbel Attaakah," or the mountain of deliverance; which appellation, together with the name of Baidah and Tiah Beni Israel, could never have been given or imposed upon these inhabitants at first, or preferred by them afterwards, without some faithful tradition, that such places had been once the actual scene of these remarkable transactions. The sea likewise of Kolsum, i.e. destruction, as the correspondent part of the Red sea is called in the Arabian geography, is a further confirmation of this tradition. Moreover, the Ichthyophagi, who lived in this very neighbourhood, are reported by Diodorus Siculus (l. iii.) to have preferred the like traditionary account from their forefathers, of this miraculous division of the Red sea. There are likewise other circumstances that tend to prove, that the Israelites took their departure from this valley, in their passage through the Red sea; for an account of which we refer to Shaw's Travels, ch. v.

This hypothesis, however, says Geddes, (Crit. Remarks on Exod. xiv.) has been fairly given up by our belated modern critics; and the "Sinus Henoopolitanus," or gulf of Suez, pitched upon as the scene of action. The idea was first suggested by Le Clerc, and since adopted and defended by Michaelis, Niebuhr, and almost all the German commentators. But Mr. Bryant still contends for Bedea (Baidah), and calls the arguments of Niebuhr "prejudice and misconception." Dr. Geddes, whose sentiments concerning Morses and his whole history are singular, denies that there was any thing miraculous in the event; and strenuously maintains, that Suez or its vicinity was the place of passage; for here, he says, at this day, are shallows fordable at low water, and which might, in former times, have been frequently dry. We will show what changes happen in the bed of seas as well as that of rivers, especially where that bed is sand, which is the case with that of the gulf of Suez. The occurrence is thus described by Dr. Geddes. When Moses saw that the Egyptians had found out that the Israelites meant not to return, and were about to pursue him with a force which he could not resist, he wisely took the only course that was most likely to afford him an escape. Acquainted, as he must have been, during his long stay in Midian, with the nature of the Red sea, and its ebbs and flows, he deemed it better to take his chance of passing over some shallow which he knew to be fordable at low water, than to expose himself to be overtaken in a defert, where no stratagem could save him. If he got the start of the Egyptians but for a single day, he would have time to watch the tide, and begin his march as soon as the passage was fordable; and in the space of a few hours might be safe on the other side. The width of the sea at Suez is at present, according to Niebuhr's measurement, 757 double paces, or 3450 feet. It is common for the Arabs to pass on foot over this passage, although not always without danger, as the sea sometimes flows back unexpectedly. At Suez, according to Niebuhr, it is low water, at the full of the moon, at half past six; but as the passage of the Israelites must have happened some days after the full of the moon, the ebb and flow must have been considerably later, and the former must have occurred in the night-time, during which the Israelites were said to have passed. Michaelis was of opinion, that, as a strong wind is said to have accompanied this event, it might have caused a double ebb, as it sometimes does on the coast of Holland and the North Germany; but Niebuhr thinks that no such thing is likely to happen in the Red sea. Be this as it will, the wind might certainly have prolonged the ebb; and, if it happened at the time of the passage, might well be considered as a providential interference, and readily confused into a miracle. Josephus, in recording this transaction, puts a formal speech into the mouth of Morses to the terrified and discontented people, and a prayer to God before he strikes the sea with his rod; yet he tells us that all this he invented as he found it in the sacred books. But he seems not sure, whether to consider it as a miracle or a natural effect. "Let no one," says he, "wonder at this account of a way of safety being opened to those old-world innocent folks, even through the sea, whether by the will of God or naturally; since, of later days, the Pamphylean sea opened a
way for Alexander's army, when God through him had decreed to overturn the Persian empire." (Antiq. l. ii. c. 16. n. 5.) For this he appeals to all Alexander's historians; and, indeed, both Appian and Arrian, who relate the event, seem to have considered it as a sort of divine interposition; but honel Strabo tells us, that Alexander only took the advantage of low water; and, trusting to his good fortune, passed through the strait with his army; but not on dry land; for the water came up to the navel. (Strab. l. xiv.) The same was the case with Scipio's soldiers, who surprised New Carthage by taking the advantage of an ebb; although they waded sometimes up to the knees, at other times up to the navel, in water. (Liv. l. xxvi.) Here, says Geddes, the fame two natural causes, the tide and a strong wind, concurred to make a passage through the water, as accompanied at the passage of the Red sea; and in both cases they were converted into a miracle. Josephus concludes his narrative with these words. "Of such things, let every one think as he pleases;" and the author now cited adopts his language. It has been said, and thus the priests of Memphius explained the history (see Euseb. Prep. l. iv. c. 17.), that Moses taking advantage of the time of the ebb, led the Hebrews over in safety; but the Egyptians, not knowing the nature of the sea, and easily entering it just before the return of the tide, were all swallowed up and drowned.

In opposition to all conjectures for explaining this history, without having recourse to a miracle, we shall content ourselves with appealing to the history itself, Exodus, xiv. 16, 17, &c. from which it appears that the Hebrews traversed the sea from shore to shore, on a large space of dry ground, which was left by the retreating waters; and that they were driven back to overwhelm the pursuing host of Pharaoh. See also Izaiah, lxxvi. 11, &c. Habakuk, iii. 15. Wisdom of Solomon, xix. 7, 8, x. 17, 18.

It is thought, says Calmet, after Eusebius, that the place where the Hebrews passed the Red sea, is two or three leagues below its northern point, at the place called Kofium, or Clyfima. Niebuhr informs us that, wherever on the coast of Arabia, we meet with indications, that the waters are withdrawn; e. g. Mufa, which ancient authors mention as a port of Arabia, is now at many leagues distance from the sea; near Loheta, and Gibid, we see great hills filled with the same kind of shells and corals, as are now found living in the sea; near Suez, are petrifications of all these things. From these and similar circumstances it infers, that some thousand years ago this Arabian gulf was much larger, and extended much farther north, especially that arm of it near Suez, for the shore of this extremity of the gulf is very low. The breadth of the arm of the sea at Suez, he adds, is about 3,500 or 3,500 feet (in its present state). Although it would much shorten the distance of their way, no caravan now crosses this arm, nor could the Israelites have crossed it, without a miracle. The attempt must have been much more difficult to the Israelites, some thousand years ago, the gulf being then probably larger, deeper, and longer toward the north, at the lowest time of the tide. Niebuhr crossed, when returning from mount Sinai, that arm of the sea, over to Kofium, upon his camel; and the Arabs, who accompanied him, were only immerged to their thighs in water. The banks of the Red sea are pure sand from Suez to Girondel; but lower to the south are banks of coral. If the Israelites had crossed the sea upon such banks, they must have been greatly incommoded by them.

The Red sea, notwithstanding the difficulty and danger, and also the tediousness of its navigation, was, for many ages, before the discovery of the passage by the Cape of Good

Hope, the channel of communication between Egypt and other countries, bordering on the Mediterranean, and India. Accordingly, Dr. Robertson observes, in his "Historical Disquisition concerning Ancient India," that navigation made its first efforts in the Mediterranean and the Arabian gulf, and that in them the first active operations of commerce were carried on. Nor are the accounts of the earliest historians in this respect at all improbable, if we consider the position and form of these two great inland seas. They lay open the continents of Europe, Asia, and Africa, and spreading to a great extent along the coasts of the most fertile and most early civilized countries in each, seem to have been defined by nature to facilitate their communication with one another. We find, accordingly, that the first voyages of the Egyptians and Phenicians, the most ancient navigators mentioned in history, were made in the Mediterranean, and, moreover, by acquiring early possession of ports on the Arabian gulf, they extended the sphere of their commerce, and are represented as the first people of the west who opened a communication by sea with India. Selinus, in the course of his reign (if we may give credit to some historians), was able to fit out a fleet of 400 ships in the Arabian gulf, which conquered all the countries stretching along the Erythraean sea to India. The Phenicians, who, by their situation on the Mediterranean, and the imperfect state of navigation, could not attempt to open a direct communication with India by sea, were prompted by the entering spirit of commerce to wrest from the Indus the burns of commerce. The Phenicians and Phoenicians, the nearest port in the Mediterranean to the Arabian gulf. Thither all the commodities brought from India were conveyed over land by a route much shorter, and more practicable, than that by which the productions of the East were carried at a subsequent period from the opposite shore of the Arabian gulf to the Nile. At Rhinocolura they were reloaded and transported by an easy navigation to Tyre, and distributed throughout the world. For an account of the trade which the Jews carried on by the Red sea, we refer to the article EXODUS, and WHERE DID MOSES CROSS THE RED SEA? Of the manner in which the Egyptians carried on their trade with India by means of this gulf, see ALEXANDRIA and BERENICE.

All the commercial transactions of the ancients with the East were confined to the ports on the Malabar coast, or at the farthest extended to the island of Ceylon. To these staplers, the natives of all the different regions in the eastern parts of Asia brought the commodities which were the growth of their several countries, or the product of their ingenuity, in their own vessels, and with them the ships from Tyre and from Egypt completed their movements. While the operations of their Indian trade were carried on within a sphere so circumscribed, the conveyance of a cargo by the Arabian gulf, notwithstanding the expense of land-carriage, either from Elath to Rhinocolura, or across the desert to the Nile, was so safe and commodious, that the merchants of Tyre and Alexandria had little reason to be solicitous for the discovery of any other. During the period in which this mode of carrying on commerce sufficed, the price of goods imported from India into Europe was very much enhanced by the various operations to which the conveyance of them was subject. In Ceylon, or the ports on the Malabar coast to which they were brought from the various countries of Asia by the natives, they were put
put on board the ships which arrived from the Arabian gulf. At Berenice they were landed, and carried by camels 258 miles to the banks of the Nile. There they were again embarked, and conveyed down the river to Alexandria, whence they were dispatched to different markets. But, after the passage to India by the Cape of Good Hope was discovered by Vasco de Gama, at the close of the fifteenth century, its various commodities were purchased at first hand in the countries of which they were the growth or manufacture; and the carriage of mercantile goods by water is much less expensive than by any other mode of conveyance, the Portuguese, as soon as they could import the productions of India in sufficient quantities to supply the demands of Europe, were able to afford them at such a reduced price, that the competition of the Genoese and the Venetians, who had been actively engaged in this commerce, ceased almost entirely; and the full stream of commerce took its natural direction towards the cheapest market. The consequence was, that early in the sixteenth century, the subjects of the Portuguese monarchs became possessed of a monopoly of the trade with India, founded upon the only equitable title, that of furnishing its productions in greater abundance, and at a more moderate price. From the era of the discovery now mentioned, the Arabian gulf or Red sea lost its importance as a channel of communication between the western and eastern parts of the globe; and from this time both its navigation, and the commerce connected with it, have been partial and restricted. An account of its principal ports will be found under their respective articles.

**REDA**, a town of Turkish Armenia, in the government of Erzerum; 36 miles N. of Ipira.

**REDANS**, or **REDDANT** See REDENS.

**REDARIDES**, in Geography, a town of France, in the department of the Mouths of the Rhone; 16 miles S.S.E. of Orangi.

**RED BOOK of the Exchequer** (*liber ruber faccarii*) is an ancient record, in which are registered the names of those that held lands *per baroniam* in king Henry II.'s time. It is a manuscript volume of several miscellaneous treaties, in the keeping of the king's remembrancer, in his office in the exchequer; and hath some things (as the number of the hides of land in many of our counties, &c.) relating to the times before the Conquest. There is likewise an exact collection of the ecuages under king Henry I., Richard II., and king John; and the ceremonies used at the coronation of queen Eleanor, wife to king Henry III. &c.

**REDDAT.** *Precipe quod reddat.* See PRECIPITE.

**REDDENDIS CHARTIS.** See CHART.

**REDDENDUM, in Law,** a clause in a lease, &c. by which a rent is referred to the lefior; which anciently consisted of corn, flesh, fish, and other viands. 2 Rep. 71.

**REDDIDIT &c.,** is where a man procures bail for himself to an action in any court at law; if the party bailed at any time before the return of the seconz *facta facti* against the bail, renders himself in discharge of his bail, they are thereby discharged. 2 Litt. Abr. 430. See BAIL.

**REDDITARIUM,** an ancient law term for a tarry, roll, or rental, in which the rents and services of a manor are set down.

**REDDITION, REDDITO,** a surrendering or restoring. In Law, it also denotes a judicial acknowledgment that a thing in question belongs to the demandant, and not to the persons to surrendering.

**REDDITUS ASSISUS,** a set or standing rent. See ASSISUS.

**REDDELE, Red Ochr, or Red Chalk,** in Mineralogy, the red oxd of iron intermixed with earthy matter. It is Vol. XXIX.

used for crayons, either in its natural state, or pounded and washed, and afterwards mixed with gum, and cast into moulds. The colour of reddele varies from a blood-red to a brown-red; its fracture is earthy; it is soft, friable, and flains the fingers. See *Orce of Iron.*

This is the common English name for the substance called in Latin *rubicularia,* and used in painting, and for marking sheep, &c. There are two kinds of it, a harder and a softer.

The first, or harder kind, is but little in use, except among the turners in wood, as it does not mark so easily, requiring to be first wetted, and then pressed hard upon the substance to be marked. This is dug in Lincolnshire, Hampshire, and Suffolk; and is a hard dry earth, of a somewhat pale red, like the common pale red bricks, and is of a very regular and close texture, and always composed of a number of thin lamina, lying closely and evenly on one another. It is of a rough uneven surface, adheres firmly to the tongue, is not easily broken between the fingers, and flains the hands a little; it is of a very atfrangent taste, and melts pretty readily in the mouth. It is very readily diffusible in water, mouliderng to powder, soon after being thrown into it; and makes no effervescence with acids.

The second, or softer kind, is very common, and put to a number of different uses. It makes simply a very good pale red for the painters, and is very serviceable to them in their mixed colours. It is in constant use in many parts of the kingdom for the marking of sheep; and when washed and separated from its sandy particles, is, by some of our modern druggists, sold under the name of bole armenic.

It is found in many parts of the world; the best in England is that from several parts of Derbyshire, from whence the colour-flops and druggists of London are supplied; many of the latter thinking this a shorter method than the common one of our bole armenic makers, of preparing it from a mixture of tobacco-pipe clay, and the red ochre called Spanish brown.

This soft, or common reddele, is a loose ponderous earth, of a lax texture, and very friable; and of a pale, but tolerably bright red, of a somewhat smooth and glossy surface, soft to the touch, adhering firmly to the tongue, easily broken between the fingers, and flains the hands a little; it is of a very atfrangent taste, and melts pretty readily in the mouth. It is very readily diffusible in water, mouliderng to powder, and makes no effervescence with aqua fortis. Hill.

Some call reddele, *lapis hamatticus*; but the real hamattites is another thing.

**REDEEMABLES, in Law,** are lands, funds, &c. sold with a reservation of the equity of redemption.

Crown lands are redeemable for ever; others only for a certain time.

**RE-DELIVERY,** an yielding or delivery back of a thing; if a person has committed a robbery, and stolen the goods of another, he cannot afterwards purse the offence by any re-delivery. Co. Litt. 69. H. P. C. 72.

**RE-DEMISE.** See DEMISE.

**REDEMPTION, REDENTIO,** a faculty or right of re-entering upon lands, &c. that have been sold, and affigned; upon reimbursing the purchase-money, with legal costs.

Bargains in which the faculty, or, as some call it, the *equity of redemption,* is referred, are only a kind of pignerative contracts.

A certain time is limited, within which the faculty of redemption shall be exercised; and beyond which it shall not extend.

**REDEMPTION, in Theology,** denotes the recovery of man-kind.
kind from sin and death, by the obedience and sacrifice of Christ, who on this account is called the Redeemer of the world. See COVENANT.

REDUCTIONS, Reductions, in our old Law Writers, denote grievous mulcts imposed by way of commutation for the head or life of the delinquent.

REDEMPTION OF THE NATIONAL DEBT. See Fund.

REDEN, or REDYIN, in Geography, a town of Prufia, in the territory of Culm; 20 miles N.E. of Culm.

REDENS, REDANS, or REDANT, in fortification, a kind of work indented in the form of the teeth of a saw, with salient and re-entering angles; to the end that one part may flank or defend another.

It is also called face-work, and indented work. The faces in this flank another.

Redens are frequently used in the fortifying of walls, where it is not necessary to be at the expense of building battlements; as when they stand on the side of a river, a marsh, the sea, &c. But the fault of such fortification, is that the besiegers from one battery may ruin both the sides of the tenaille or front of a place, and make an assault without fear of being enfiladed, since the defences are mined.

The parapet of the corridor also is frequently redented, or carried on by way of redens.

REDES, in Geography, a river of South America, which runs into the gulf of Darien, N. lat. 7° 37'. W. long. 70° 40'.

REDBITION, REDITION, in the Civil Law, an action allowed a buyer, by which to annul the sale of some movable, and oblige the buyer to take it back again, upon the buyer's finding it damaged, or that there was some personal cheat, &c.

The redhibition, or redhibitory action, has a place in several cafes, in the body of the civil law. If a horse was sold that had the glanders, were broken-winded, or foundered, it was a redhibitory cafe; and the seller might be obliged to take him again within nine days.

REDI, Francis, in Biography, an Italian physician, was defended from a noble family, and born at Arezzo, in Tuscany, in the year 1626. He commenced his studies at Florence, and then removed to Pisa, for the prosecution of his philosophical and medical pursuits, where he received the degree of doctor in both these sciences. He had acquired great reputation both in science and literature, and was induced to settle at Florence, where he at length gained the favour of the court, and was appointed first physician to Ferdinand II. duke of Tuscany, and subsequently to Cosmo III. These appointments and his constant professional employment did not, however, prevent him from cultivating his favourite study of the belles lettres. He devoted much of his time to the language of his country, and contributed not a little to the perfection of the dictionary of the academy of La Cruca, of which, and of several other learned bodies, he was a member. Totally free from presumption, and attached to every cultivator of learning and science, he was always ready to give his assistance to them in every way he could, and was universally esteemed and beloved. He displayed both in his practice, and in the prosecution of his inquiries in natural history, a singular acuteness of observation, and a complete incredulity as to the marvellous, which was so prevalent in his time; and he cautioned his friends and pupils against the popular errors in this respect. Although he was afflicted with epileptic fits in his latter years, yet he appears neither to have abandoned his studies, nor his professional business, until his death, which took place in 1697, in his 71st year.

Redi was the author of several Italian poems, which are held in much estimation. His other works were all written in Italian, and his style was deemed to pure and elegant, that the authors of the dictionary of La Cruca have often cited it as a standard. Most of his writings on natural history have been translated into Latin; especially his "Experimenta circa Generationem Infectorum, cum Figuris Axis," his "Observationes de Viperis," his "Experimenta circa diversas Res naturales, specieim illas que ex Indis adferuntur," and his "Observationes de Animalibus viventibus, que intra Animalia viventia reperiuntur." He also published a letter on the Use of Spectacles, and an Essay on Styptics. Eloy Dict. Hist. de la Med.

Redi, in the notes to his "Baco in Torecano," a dithyrambic poem, published in 1685, has given many curious etymologies and explanations of the medical terms used by the Italians in early times.

REDINGA, in Geography, a town of Hindooftan, in the circar of Ellore; 25 miles W. of Ellore.

REDIMICULUM, among the Romans, a girdle, which going about the neck, divided on the breast, and passing down each side, went round, and kept the robe tight to the body.

REDINGA, in Geography, a town of Portugal, in the province of Beira; 14 miles S. of Coimbra.

REDINGA, in Geography, a town of Hindooftan, in the circar of Ellore; 25 miles W. of Ellore.

REDICCATIO, REDINTegraTO, in the Civil Law, the act of restoring a person to the enjoyment of a thing, of which he had been illegally dispossessed.

In France, where a person is deprived of his property, he claims it again by redintegration, or action of restitution. But the redintegration must be demanded within a year and a day, otherwise it is precluded.

Redintegration, in Chemistry, the restoring of any mixed body, or matter, whose form has been destroyed by calcination, corrosion, sublimation, or the like, to its former nature and constitution.

The redintegration of mercury is properly called revivification. Mr. Boyle has an express treatise on the redintegration of sulphur; where he shows, that after reducing it by fluxion into fixed nitre, which is next to kind of salt of tartar in all its properties, he could perfectly redintegrate it, by pouring a sufficient quantity of spirit of nitre on it; i.e. he could re-produce true crystals of the usual form and virtue of sulphur.

It is a strong objection against the chemical principles, that we cannot redintegrate the body they were procured from, by re-mixing them.

This seems to argue, that the body did not properly consist of such elements, or that they were not originally contained in it, but were rather produced by the fire.

REDIPATAM, in Geography, a town of Hindooftan, in Marwar; 18 miles N. of Ramadnapuram.

REDIRE ad Pacem, in Law, is applied to a person, whose outlawry is revocable, and who is restored to the king's peace.

REDisseisIn, a difficulty made by him who once before was found and adjudged to have diffiged the fame man of his lands or tenements; for which there lies a special writ, called a writ of redissetin. See ABSET OF Novel Differsin, DFDerIn, and Post-DiffersIn.

REDIANS, or RADIANs, in Doomsday and other ancient books, are probably the name with rod, or rad-knights; viz. men who, by the tenure or custom of their lands, were to ride with, or for, the lord of the manor, about his business.

REDNITZ, in Geography, a river of Germany, formed by the union of the Upper and Unter Rellat, about 5 miles S. of Reth, in Franconia. After receiving in its course several

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several streams, it discharges itself into the Maine, a little below Bamberg.

REDDESCO, a town of Italy, in the department of the Mincio; 14 miles W.S.W. of Mantua.

REDON, a town of France, and principal place of a district, in the department of the Ille et Vilaine; 32 miles S.S.W. of Rennes. The place contains 3783, and the canton 11,620 inhabitants, on a territory of 1875.54 square kilometres, in 5 communes. N. lat. 47° 39'. W. long. 2°.

REDONDA, an island in the West Indies, about 10 miles in circumference, without ports, rivers, or towns. N. lat. 16° 55'. W. long. 62° 20'.

REDONDILLA, or REDONDILLA, a town of Spain, in the province of Galicia, near the west coast, defended by a strong castle; 32 miles W.S.W. of Orense.

REDONDO, a rock, about three miles in circumference, between the islands of Montserrat and Nevis, in the West Indies. N. lat. 17° 6'. W. long. 61° 35'.

REDONDO NOVA, a town of Benguela. S. lat. 11° 22'. E. long. 12° 45'.

REDONDOS, O, a town of Portugal, in Alentejo; 14 miles E.E. of Lisboa. N. lat. 38° 33'. W. long. 7° 22'.

REDONDOS, a town of Portugal, in the province of Beira; 17 miles S. of Coimbra.

REDDOUBLE, Fr., in Musie, a doubled interval in the octave above a single interval. The octave of the octave, with us, is called the 15th. See INTERVAL.

REDOUTI, or REDOUTE, Redoutus, in Fortification, a small square fort, without any defence but in front, used in trenches, lines of circumvallation, contravallation, and approach; as also for the lodging of corps de garde, and to defend passages. See Fort.

They are usually figures of three, four, five, or six sides, encompassed with a ditch, and a bank of earth, which consists of two parts, called rampart and parapet.

In marly grounds, redoubts are often made of stone-work, for the security of the neighbourhood; their face consists of from ten to fifteen fathoms; the ditch round them from eight to nine feet broad and deep; and their parapets, which are cut into embrasures and merlons, have the same thickness. See REDUCTION.

The inner sides of square redoubts are usually between the limits of twelve and thirty-two yards; and when they are to be defended by musketry, the number of men necessary to the defence may be thus determined: half the side figured gives the number of troops; and twice the square root of a given number of men, shews the length in yards of the side of a square redoubt proper to contain them.

To construct a square redoubt.—Mark out a square, whose side is adapted to the number of troops allotted for the defence, as A B (Plate VII. Fortification, fig. 5.) for the base of the rampart. About this square, at the distance of ten or twelve feet, describe another square, whose side, C D, is the inner boundary of the parapet; make a parapet of about nine or ten feet thick, whose outline is the line E F; leave a beam about three or four feet broad, whose side is G H; and dig a ditch about sixteen feet wide, and about six or seven feet deep, which should be rounded before the angles of the redoubt. Make the rampart from four feet to nine or ten feet high; let the parapet be six or seven feet higher, and let the footbank be four feet and a half lower than the crown of the parapet. On this side most fucures from the enemy, make a bridge across the ditch, and a palisade through the rampart, about four or five feet broad when the defence is musketry, about nine or ten feet broad when cannon are to be used; and fling up the palisade by a strong gate. If the redoubt is to be defended by cannon, both the rampart and parapet should be at least five or six feet thicker. In order to make the fire pretty nearly equal on all sides, and sufficient for defending the angles of the work, M. Clairac has contrived to cut the inside of the parapet into notches, whose two sides, of a yard each, are at right angles to one another, and make half-right angles with the sides of the work; the manner of which, and its defence, are plainly shewn in the figure, where the lines with dots at the ends represent the fire three different ways from the same side.

For the method of constructing flanked redoubts, see Fort.

A detached redoubt is a kind of work resembling a ravelin, with flanks, placed beyond the glacis; such as B (Plate V. Fortification, fig. 6.) They are made in order to occupy some spot of ground which might be advantageous to the besiegers; and likewise to oblige the enemy to open their trenches farther off than they would otherwise do. Their distance from the covert-way ought not to exceed a hundred and twenty toises, that they may be defended by musket-shot from thence. The gorge, a, b, is forty toises; the flanks, a c, b f, which are perpendicular to the gorge, ten; and the faces, a d, f d, thirty; the ditch before it is fix toises, ending in fleaves at both ends; the covert-way, four; the branches of the covert-way, twenty toises long; the faces of the places of arms, p, y, which are perpendicular to the branches, ten; and the other, which is parallel to them, fourteen. The communication from the covert-way to the redoubt is five or six toises wide; and there is a traverse made just at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a slope or glacis. Robertson's Marine Fortif. p. 20, &c. Muller's Fort. p. 43, &c. See ARROW.

Redoubts are also small works of the same form made in a ravelin.

REDOUTE, Castle or DONJON. See REDUCTION.

REDOUTES en Cremailles, differ from other redoubts by having the inside line of the parapet broken, so as to resemble a pot-hook, or the teeth of a saw; by which a greater fire can be brought to bear upon the defile than if only a simple face was opposed to it, and consequently the passage is rendered more difficult.

REDOUTES de TERRE, Fr. redoubts that are halfly thrown up, and made with earth, for the purpose of securing entrenchments, circumvallations, passageways of rivers, &c.

REDOUTES de Macaronières, Fr. redoubts made of masonry; generally constructed in places where an enemy might derive advantage from establishing himself; they are likewise built upon the fallant angles of the glacis.

REDOUTES Cafematées, Fr. cased redoubts, or such as are arched over and made bomb-proof. Those constructed for the defence of Gibraltar, and for the security of Dover castle, are of this description.

REDOUTES à MACHICOUR, Fr. are those which are made of brick or stone-work several stories high. The highest story juts out about one foot beyond the wall that surrounds or fronts the redoubt.

REDRESSING, the rectifying or setting any thing straight again.

Trees and other plants have a natural faculty of redressing themselves, when, by any external caue, they are forced out of the perpendicular.

In the moral lefe, to redress grievances, is to reform or remove them. The redress of injuries is the objeet with a view to which courts of justice are instituted in every civilized society; in order to protect the weak from the insults of the stronger, by expounding and enforcing those laws, which define rights and prohibit wrongs. This remedy is, therefore,
therefore, to be sought for by application to these courts; that is, by civil suit or action.

To redress a flag, among hunters, is to put him off his changes.

REDDRILL, To, in Military Language, is to put a soldier through the first elements of military training. Every soldier, after his return from long absence, must be redrilled before he is permitted to act in the ranks of a company.

REDRUTH, in Geography, a considerable market-town in the east division of the hundred of Penwith, and county of Cornwall, England, is situated on the road from Launcelton to the Land's-End, at the distance of 262 miles S.W. from London. It occupies the declivity of an eminence in the very centre of the mining district, and derives its support entirely from the mines. Dr. Percy supposes it to have been a town in Saxons times; but if so, the records of its history during that period have been entirely lost. It is first mentioned in the year 1352, when William Basset, the then proprietor of the manor, obtained for the inhabitants the privilege of fairs and markets. In 1502 a similar grant was made in favour of John Basset, Esq.; and in the time of the Cromwellians, the Earl of Morrall procured a charter for a market on Fridays, which was confirmed by king Charles II. At present there are two weekly markets, held on Wednesday and Friday; and three annual fairs, chiefly for cattle and oxer manufactures. The tolls of two of these fairs and the markets belong to the Buller family; and the other fair to lord de Dunstanville, the descendant of the Bassets. The increase of this town, since the commencement of the copper mines in the last century, has been as fast to one, as appears by the average of baptisms. According to the population register of 1801, it contained 664 houses, and 4924 inhabitants; but in 1811 the houses were returned as amounting to 879, and the inhabitants to 5903 in number.

Redruth consists chiefly of one long street. The church, the living of which is a rectory, was built, in 1770, by lord de Dunstanville, in the stead of a more ancient one. This building is situated about half a mile from the town. Here are the remains of a chapel of ease, dedicated to St. Rumon, which has been unroofed for many years. In Redruth are meeting-houses for Quakers and Anabaptists, besides two for Methodists in the town, and a third in the north part of the parish. In 1803, a large school-house was built here by subscription, and a master placed in it by the same means; but the subscription having been discontinued, the school is now kept open by the master on his own account.

Among the numerous mines in Redruth and the contiguous parishes of Gwennap, Kenwyn, and St. Agnes, those denominated the Gwennap mines are considered to be the principal. These lie to the south-east of Redruth, in a part of the county where the tin and copper leads are peculiarly rich, and in some places intersect each other. The country of the united mines Huel-Virgin, Poldice, and Huel-Unity, is schistus; that of Huel-Jewell, Huel-Gorland, and Trefewan, is granite; and it has been remarked, that the metallic veins mostly obey the course of the granite mountains, and run very nearly parallel with them. The united mines employ about 600 men, of whom 400 work under ground. The water is drawn off by four immense steam-engines, one of the cylinders of which is nearly seven feet in diameter. The Huel-Virgin mine is 160 fathoms deep, and is extremely productive; but the Huel-Unity and Poldice mines are still more rich, and are wrought to such advantage, that the proprietors usually flare from 16,000l. to 26,000l. per annum. The depth of the Poldice mine is 170 fathoms; but at present it is not worked at a lower depth than 140. This is one of the oldest mines in the county, and yields a yellowish copper ore, a rosin tin, and a few stones of galena. The Huel-Gorland mine is 120 fathoms below the surface, and is wrought at the expense of about 1000l. a month. The North Down mines, nine in number, occupy an extent of two miles in length, and one in breadth, and have their surplus water carried away by the same long adit which runs through the Gwennap mines to the Cannen-Stream works.

Besides the mines, there are several other objects in the vicinity of Redruth not undervalue of notice. Portreath, about four miles to the north, is a small sea-port for the importation of coals and lime, and the exportation of copper ore to the works in Wales. It is defended by a fort, mounting four guns, and was erected by lord de Dunstanville in the year 1782, and is maintained at his expense. Tehidy park, the ancient seat of the Dunstanville family, adjoins Portreath on the south-west. This manor is first mentioned as being in their possession as early as the year 1200, about thirty years before the marriage of Cecilia de Dunstanville with William Basset, who carried the Dunstanville estates to the Bassets. The present mansion-house is of modern erection, consisting of a centre, and four detached pavilions at the angles, the whole constructed chiefly of Cornish free-stone. The principal rooms are decorated with some good portraits by Vandyke, Kneller, and Sir Joshua Reynolds; and also with a few pieces by Rubens, Carlo Dolci, Bononi de Ferrari, Rembrandt, Borgognone, and others of less note. The park and pleasure grounds attached to this mansion are very extensive; containing about seven hundred acres, finely varied by wood and lawn, and appearing like a well-cultivated garden in the midst of a desert.

Wellward from Redruth, about a mile and a half, is Carn-breh hill, which Dr. Borlase and others contend ought to be regarded as the grand centre of Druidical worship in this county, almost every kind of monument commonly attributed to the Druids being found, as they allege, upon that eminence. How far this opinion is correct, we shall not pretend to decide; but we may observe, that several late writers maintain, that a part of the supposed monuments of religion, viz. the caves, are in fact the result of natural convulsion. No doubt, however, some of them are artificial, and probably belonged to the Druids; and what seems to corroborate this idea is, the circumstance of Redruth being a corruption for Dre-Druith, which signifies the Druids' town. On the summit of this hill is a circular fortification, called the Old Castle, which appears to have been formerly surrounded by a strong wall; and about 300 yards to the eastward, on a ledge of flinctum rocks, stands Carn-breh castle, part of which lays claim to a very high antiquity, but the remainder is of comparatively modern date. The rocks upon which this structure is erected not lying at all contiguous to each other, are connected by five circular arches thrown over the cavities.

On the south-west side of Carn-breh hill is Pendarves, the seat of John Stackhouse, Esq. It is a large handsome building, situated on an eminence commanding extensive views over the western parts of the county. In a field contiguous is a large cromlech, composed of three upright stones, and an impost. Clowance, situated about three miles further to the south-west, has been for several centuries a seat of the family of St. Aubin. The house is deeply embosomed in wood; and contains, besides several pictures of curiosity and value, a large collection of rare and choice prints, accumulated in the portfolios of its present possessor.

RED


REDSEAR. See Iron.

REDSTONE, in Geography, a town of Pennsylvania, on the Monongahela; 53 miles N.W. of Pittsburg.

REDUBBORS, those who buy stolen clothes, &c. and, to the end they may not be known, turn them into some other fashion, &c. See Frippery, and Rejuvenator.

REDUCE, in Chemistry. See Reduce.

To Reduce a Place, in Military Language, is to oblige the governor to surrender it to the besiegers by capitulation.

To Reduce the Circle, is to restore or bring back a battalion or company which has been formed in circle to its original position in line.

To Reduce the Square, is to restore a battalion or battalions which have been formed in a hollow or oblong square to their original situation in line or column.

REDUCED CHART. See Chart.

To be Reduced, in Military Language, is to be taken off the establishment, or cease to receive pay as soldiers. When a regiment is reduced, the officers are generally sent upon half pay. Sometimes, as at the close of a war, the corps are reduced, and the officers remain upon full pay. Hence are derived the expressions in and out of the break. In the break denotes the liability of being reduced: out of the break signifies the certainty of being kept upon the establishment.

To be Reduced to the Ranks, is to be taken from a superior appointment in a regiment, and to be ordered to the duty of a common soldier. This sometimes happens by way of punishment, when a sergeant or corporal misbehaves. A sergeant, however, cannot, at present, be reduced, except by sentence of a regimental court-martial.

REDUCING SCALE, is a thin broad piece of box, with several lines and scales of equal parts upon it; for turning chains and links into acres and rods, by inspection.

It is used by surveyors to reduce maps and draughts from one dimension to another; it is sometimes also called a surveying scale.

REDUCT, REDUIT, or Reduce, a military term, signifying an advantageous piece of ground, intrenched and separated from the rest of the place, camp, &c. for an army, garrison, &c. to retire to, in case of a surprize. Reduits have been sometimes made for the purpose of securing different posts in a town independent of its citadel. They were propounded by the celebrated Vauban. See Donjon.

Reduct, in Building, a kind of recess, or little place, taken out of a larger, to make it more uniform and regular; or for some other convenience, as for a little cabinet above of a chimney, for alcoves, &c.

Reduct, or Redux, among Chemists, is a powder by which calcined metals and minerals are reduced again to their regular, or pure substance.

REDUCTION, Reductio, in the Schools, a manner of bringing a term or proposition, which before was opposite to some other, to be equivalent to it.

Reduction is effected by the addition or retraction of a negative particle. Thus, to reduce this proposition, no man is an animal, to be equivalent to its opposite, every man is an animal, I drop the negative, and say, man is an animal. After the like manner might the term every man be reduced, by adding the negative and saying, there is no man.

Reduction of Propositions is used in a more general sense, for any expression of one proposition, by another proposition equivalent to it.

To a reduction, therefore, there are two propositions required, the reduced, and the reducing; which are considered as the extremes of it, and to be connected in the reduction by means of the particle that is, which here has the effect of a copula.

As here, only animals think; that is, animals think, and nothing besides animals thinks. Where the proposition preceding the particle is reduced, and the subject of the reduction; that following the particle reduces, and has the effect of the predicate of the reduction, and the particle that is acts as a copula, importing, not barely that the proposition is expounded by another, but by another equivalent one, or, as it were, the same.

Reduction of Syllogisms, is a regular changing or transforming of an imperfect syllogism into a perfect one. Or, it is a change of a syllogism in respect of form, by which the necessity of the implication, or inference, is made more evident.

Reduction obtains in syllogisms of the second and third figure; as also in the indirect modes of the first. By it these are all brought to the first.

There are two kinds of this reduction; the one direct, or often, performed merely by a conversion of one or both the premises, or by a transposition of them; as when callus is reduced to capital: the other indirect, called per impossibile, or ad absurdum; by which the person who denies the good-ness and legitimacy of an imperfect syllogism, is reduced to affirm something absurd and impossible, or contradictory to some other thing maintained by him.

Suppose, e. gr. a person granting the premises of the following syllogism, denies the conclusion: All fraud is prohibited; but some trading is not prohibited; therefore some trading is not fraud. We thus proceed against him if the syllogism be not good, the antecedent is just, but the consequent false; and, therefore, the contrary of the conclusion must be true: now I take the contrary of the conclusion, which you thus give, viz. all trading is fraud; and of that, with the other premise of the former syllogism, viz. the major, which you likewise grant, make a new syllogism; thus, All fraud is prohibited; all trading is fraud; therefore all trading is prohibited. But this proposition, all trading is prohibited, and the other, some trading is prohibited, which you granted me in the first syllogism, are contradictions.

Reduction, in Arithmetic, is the converting of monies, weights, or measures, into the same value in other denominations; e. gr. pounds into shillings and pence; or shillings and pence into pounds.

The reductions of the principal monies, coins, weights, and measures, ancient and modern, foreign and domestic, are found under Coin, Weight, Measure, Pound, Foot, &c.

Reduction is of two kinds: 1. Descending, when a quantity is to be brought from a higher denomination to a lower.

This is done by considering how many of the next less denomination are contained in the next greater before, and by that number multiplying the greater.

Thus pounds are reduced into shillings, by multiplying by 20; shillings into pence, by multiplying by 12; and pence into farthings, by multiplying by 4.

Troy pounds are reduced into grains, by multiplying by 12, 20, and 24: and avoirdupois hundreds into ounces, by 4, 28, and 16.

2. Ascending, when a lower denomination is to be reduced to a higher.

In order to this, the business is to divide the least by so many of its denomination as are contained in the next greater: thus, 24720 pence, divided by 12, and the quotient by 20, gives 103 pounds.

If there remain any thing in each division, it is respectiv-


red

R

ive either odd pence, or shillings; thus, 67½ pence reduced, give £27 l. 19s. 5d. cut off the half, the rest are the pounds required.

To expedite the practice, several compendious ways of reduction have been invented. See Practice.

Thus, yards are turned into ells by subtracting a fifth; and into ells Flemish by adding a fifth. Ells Flemish are reduced into yards by subtracting a quarter. Ells Flemish reduced to Ells by multiplying by 6, and cutting off the right-hand figure.

Great pounds of firk of twenty-four ounces are reduced to pounds of sixteen ounces by adding one-half; and pounds of sixteen ounces into pounds of twenty-four by subtracting one-third.

Reduction of Decimals. See Decimals.

Reduction of Fractions. See Fractions.

Reduction of Ratios. See Ratios, Reduction of.

Reduction of Surds. See Surds.

Reduction of Equations. Various algebraical operations are called under this head by different authors; some considering it to be the same as is otherwise, and more properly, called the solution of equations, or the finding of their roots; some define it to be the taking away or exterminating all the unknown quantities except one, otherwise called elimination; others again, under this head, treat of what is more usually termed the transformation of equations; and others again apply it to the furthering of an equation, or the reduction of it to another of lower dimensions, which latter seems to us the only operation that can properly be treated of under the above designation. See Solution, and Transformation.

There are but few cases in which the reduction of an equation can be effected, viz. only when a known relation has place amongst any of its roots, in which case the equation will admit of being reduced as many degrees lower, as there are independent conditions known to have place. So that if the relation be only between two roots, which is one condition, the equation may be reduced two degrees; if the relation extend to three roots, it may be reduced three degrees; and so on.

The conditions or relations more commonly considered, are those in which the roots of an equation form an arithmetical or geometrical progression, and when an equation has any number of equal roots. The two former relations seem rather objects of curiosity than utility, as it is not probable that an equation should have such relations obtain between its roots; but with regard to equal roots they may frequently arise in the solution of various problems. When any geometrical or physical problem is proposed, the number of its possible solutions is generally limited, and therefore the ultimate result arising out of such investigation ought to be an equation, the number of whose roots agree with the limited number of solutions. But it may happen that the analyst, by not pursuing the best mode of operation, is led to an equation of higher dimensions than is requisite, in which cases, upon investigation, it will always be found that his refuting equation has some number of equal roots, which being taken away, will reduce the equation to one of lower dimensions, which gives the proper number of solutions to the original problem. As to the cases in which the roots of an equation form a geometrical progression, they occur almost exclusively in the solution of binomial equations, having prime indices, a property which M. Gaufi has turned to a good account in the solution of these equations. See Polygon, and Reciprocal Equations.

Nearly all other relations between the roots of equations are feigned for the purposes of framing questions, and excising the ingenuity of authors and their students.

1. To ascertain whether a proposed equation has any equal roots.

Let \( x^n + \alpha x^{n-1} + \beta x^{n-2} + \gamma x^{n-3} + \&c. = 0 \), be any equation whose roots are \( a, b, c, d, \&c. \) then from the known theory of equations we have

\[
\begin{align*}
(x - a) (x - b) (x - c) (x - d) & \ldots & \ldots \\
(x - a) (x - b) (x - c) & \ldots & \ldots \\
(x - a) (x - b) & \ldots & \ldots \\
(x - a) & \ldots & \ldots \\
& \ldots & \ldots \\
& \ldots & \ldots
\end{align*}
\]

And it may be shown also, that the equation \( m x^n + (m - 1) x^{n-1} + (m - 2) x^{n-2} + \&c. = 0 \), and

\[
\begin{align*}
(x - a) (x - b) (x - c) & \ldots & \ldots \\
(x - a) (x - b) (x - c) & \ldots & \ldots \\
(x - a) (x - b) & \ldots & \ldots \\
(x - a) & \ldots & \ldots \\
& \ldots & \ldots \\
& \ldots & \ldots 
\end{align*}
\]

that is, it is equal to the sum of all the \( m \) equations that can be formed by the different combinations of the \( m \) first roots, taking \( m - 1 \) at a time. (See Waring’s Meditationes Algebraicae, cap. 3.) Now if we suppute the first equation to have two equal roots, as, for example, \( a = b \), the above products will become

\[
\begin{align*}
x^n + \alpha x^{n-1} + \beta x^{n-2} + \gamma x^{n-3} + \&c. &= \]

\[
\begin{align*}
(x - a) (x - a) (x - c) (x - d) & \ldots & \ldots \\
(x - a) (x - a) (x - c) & \ldots & \ldots \\
(x - a) (x - a) & \ldots & \ldots \\
(x - a) & \ldots & \ldots \\
& \ldots & \ldots \\
& \ldots & \ldots 
\end{align*}
\]

where it is obvious that both the one and the other of these equations have the same factor, viz. \( (x - a) \).

If the equation had three equal roots, it is equally obvious that both equations would have the common factor \( (x - a)^3 \); and generally, if the equation had \( p \) equal roots, they would both have the common factor \( (x - a)^p \).

Therefore, when it is proposed to find whether a given equation have equal roots, we must from the proposed equation draw the derived equation as above, (which, it will be observed, is the same as would arise from the taking of the fluxion of the first, leaving out of course the \( x^2 \))s) and find by the usual methods, whether these two functions have any common measure; which, if they have, will furnish us with the equal root sought; and consequently the original equation may then be reduced by division to another of two degrees, lower dimension for two equal roots; of three degrees, lower for three, and so on.

Exam. 1.—It is required to find the equal roots of the equation \( x^5 - 48x - 128 = 0 \).

Here the derived equation is \( 3x^4 - 48 = 0 \), and the common measure of these two functions is \( x + 4 \); whence \(-\frac{3}{2} \) and \(-\frac{7}{2} \) are the equal roots; the third root being \( 8 \).

Exam. 2.—It is required to ascertain whether the equation

\[
x^5 + 3x^4 - 14x^3 - 12x + 40 = 0
\]

have equal roots, and what they are.

Here the derived equation is

\[
4x^3 + 9x^2 - 28x - 12 = 0
\]

and the common divisor of the two is \( x - 2 \), whence \( x = 2, 2 \), which are two of the equal roots. Divide now the original equation by \( x^2 - 4x + 4 \), and we have

\[
x^3 + 7x + 10 = 0
\]

whole
whose roots are $-2$, and $-5$; therefore, the four roots of the proposed equation are $2$, $2$, $-2$, $-5$.

If the roots of an equation be equal, but with contrary signs, the operation is more simple. For, in this case, we have only to change the signs of the roots in the proposed equation, by changing the alternate signs of its coefficient; and we shall thus have two equations, having necessarily a common quadratic factor of the form $x^2 - a^2$, which may be found, and the equation depressed as before.

Exam. 3.—Required the roots of the equation $x^4 + 3x^3 - 7x^2 - 27x + 18 = 0$, two of which are equal, but with contrary signs.

By changing the signs of the alternate terms, we have $x^4 - 3x^3 - 7x^2 + 27x + 18 = 0$, the common quadratic divisor of which is $x^2 = 9 = 0$; whence the equal roots with contrary signs are $3$, and $-3$. Now dividing the proposed equation by $x^2 - 9$, we have $x^2 + 3x + 2 = 0$;

whence $x = \frac{-3 \pm \sqrt{1}}{2} = -2$, and $-1$, which are the other two roots.

On this subject the reader should consult Waring's Meditationes Algebraicae, cap. 3. See also Bonnycastle's Algebra, vols. i. and ii.

Reduction of Interest of the Public Debt. See Fund.

Reduction of Curves. See Curve.

Reduction of a Figure, Design, or Draught, is the making a copy of it, either larger or smaller than the original, thus preserving the form and proportion.

The great use of the proportional compasses is in the reduction of figures, &c. whence they are also called compasses of reduction.

There are various methods of reducing figures, &c.; the most easy is by means of the pentagraph (which see), or parallelogram; but this has its defects. The best and most usual methods of reduction are as follow:

To reduce a figure, as A B C D E (Plate XII. Geometry, fig. 5.) into a lesser compasses.—About the middle of the figure, as $z$, pitch on a point; and from this point draw lines to its several angles, A, B, C, &c. then drawing the line $a b$ parallel to AB, be parallel to BC, &c. you will have the figure $a b c d e$ similar to A B C D E.

If the figure $a b c d e$ had been required to be enlarged, there needed nothing but to produce the lines from the point beyond the angles, as $z D$, $z C$, &c. and to draw lines, viz. D C, B C, &c. parallel to the sides $d e$, $e b$, &c.

To reduce a figure by the angle of proportion.—Suppose the figure A B C D E (fig. 6.) required to be diminished in the proportion of the line A B to $a b$ (fig. 7.); draw the indefinite line G H (fig. 8.), and, from G to H, let off the line A B; on G describe the arc H 1; let off the line $a b$ as a chord on H 1, and draw G I. Then with the angle I G H you have all the measures of the figure to be drawn. Thus to lay down the point $e$, take the interval B C, and upon the point G describe the arc K L; also on the point G make a perpendicular on G M; and upon a, with the distance G M, describe an arc cutting the preceding one in $e$, which will determine the side $d e$. And after the same manner are all the other sides and angles to be described. The same process will also serve to enlarge the figure.

To reduce a figure by a scale.—Measure all the sides of the figure $e$, gr. A B C D E, by a scale, and lay down the same measures respectively, from a smaller scale in the proportion required.

To reduce a map, design, or figure, by figures.—Divide the original into little squares, and divide a fresh paper of the dimensions required, into the same number of squares; which are to be larger or less than the former, as the map is to be enlarged or diminished.

This done, in every figure of the second figure, draw what you find in its correspondent one in the first.

Reduction to the Ellipse, in Astronomy, is the difference between the argument of latitude, as N P (Plate XIX. Astronomy, fig. 10.) and an arc of the ecliptic N R, intercepted between the plane of a planet and the node N.

To find the reduction.—The angle of inclination P N R, and the argument of latitude N P, being given, find, by the doctrine of spherics, the arc N R; subtract N R and N P from each other, the remainder is the reduction.

Reduction into first Matter, is a term which alchemists formerly used, when they found their substances putrefy, and grow black.

Reduction was particularly used for the conversion of a dry matter into a liquid, particularly into water; which by the alchemists was held the principle of all things.

The reduction of metals into their first matter, or principles, according to these philosophers, can only be effected by mercury; nothing else being able to loosen the fixed sulphur of metallic bodies, which binds them together.

Reduction, in Metallurgy, is the decomposition of a metallic oxyd, so as to leave the metal in a state of greater or les purity, and exhibiting the lustre which is so essentially characteristic of metallic bodies.

Reduction is, for the most part, effected by charcoal and a high temperature, either with or without the assistance of fluxes. For the various modes of reduction in actual practice, see the articles of the different metals.

Reduction, in Surgery, denotes an operation by which a dilated, luxated, or fractured bone is restored to its former place. Reduction, or reposition, is always to be performed before any remedy be applied.

Reduit, in Military Affairs. See Reduct.

Redundancy, or Redundance, a fault in discourse, confining in the use of a superfluous word; Words perfectly synonymous are redundant, and ought to be abridged. Redundancy necessarily makes the style weak and languid. See Pleonasm.

Redundant Hyperbola, in Geometry, is a curve of the higher kind, thus called, because it exceeds the conic section of that name in the number of its hyperbolic legs; being a triple hyperbola, with six hyperbolic legs.

Redundant Interval, in Music, is used for an interval exceeding the truth by a comma.

Some apply redundant to an interval exceeding a diatonic interval by a semitone minor; but this is more usually called a superfluous interval. See Interval and Second.

Reduplication, in Rhetoric, a figure by which a verce begins with the same word as the preceding one ends with. See Anadiplosis.

Reduplication, in Logic, is a kind of condition expressed in a proposition, indicating or alluding the manner in which the predicate is attributed to the subject.

The usual reduplicative words are guatentus, as, so far as, considered as, inasmuch as, &c. Hence.

Reduplicative Propositions, are such in which the subject is repeated, with some circumstances or condition. Thus, Men, as men, are rational; kings, as kings, are subject to none but God.

Redutea, in Botany, so called by the late M. Ventenat, in honour of his friend M. P. J. Redouté, one of the most accurate and intelligent botanical draughtsmen, and perhaps the finest botanical painter, ever known. He is the author of a splendid coloured work in folio, on the Liliaceous
liaceous tribe, including some other beautiful plants allied thereto, which has already extended to the seventh volume; and it is to his pencil that the perfection of most botanical works that have appeared in France, for near thirty years past, particularly the publications of L’Héritier and Ventenat, is owing.—Ventenat, Jard. de Cels, t. 11. Poiret in Lamarek Dict. v. 4. 87.—Clafs and order, Monodelphia Polyandria. Nat. Ord. Columnifera, Limn. Malasses, Jull. Gen. Ch. Cal. Perianth inferior, double, permanent: the outer of many minute leaflets: inner much larger, of one leaf, in five very deep segments. Cor. Petals five, roundish kidney-shaped, imbricated obliquely, united at the base to each other, and to the column of the filaments. Stam. Filaments numerous, united below into a conical tube, subdivided and branched above; anthers kidney-shaped. Pffl. Germen superior, ovate, simple; stye thread-shaped, swelling upwards, about as long as the filaments; stigmas three, obtuse. Peric. Capsule ovate, of three cells and three valves, the partitions from the middle of each valve. Receptacles of the seeds three, inserted into the base of the capsule, alternate with the valves, and nearly equal to them in length, linear, bearing seeds on each edge. Seeds fix or eight in each cell, obovate, minutely stalked, inserted in two rows on the receptacle, each clothed with dense wool. 

Eff. Ch. Calyx double; the outer of many minute leaves; inner in five deep segments. Stigmas three. Capsule of three cells and three valves. Seeds enveloped in wool. Receptacles three, linear, unconnected with the valves. 

Obf. Ventenat considers the three distinct receptacles, as affording the most essential diftinction, between this and every other malvaceous genus. The woody feeds, moreover, distinguishing it from all except Gossypium, whose large three-leaved outer calyx is abundantly different from Reduetia. 

The only known species is

1. R. heterophylla. Various-leaved Reduetia. Vent. Jard. de Cels, t. 11.—Discovered by Riedlé in the island of St. Thomas, and raised in M. Cels’s garden at Paris. The plant is herbaceous and annual, and M. Ventenat seemed to think it might serve to decorate our flower-borders, like other annuals of very hot climates, in the open air, being, we suppose, raised on a hot-bed in the spring. Every part of the herbage is bespangled with small, white, fringed scales, readily seen with a magnifying-lens. The root is spindle-shaped, yellowish. Stem erect, twelve or fifteen inches high, about the size of a goose-quill, angular, pithy, branched, leafy, dark green, many-flowered. Leaves alternate, on longiflalks, spreading widely, ovate, undivided or three-lobed, entire, an inch or inch and half long; paler beneath. Stipulas minute, awl-shaped, deciduous. Flowers large, hand-like, sulphur-coloured, with a dark purple radiating spot at the base of each petal, solitary, erect, on long,imple, axillary flanks. Segments of the inner calyx nearly linear, half as long as the petals. Style hairy. Capsule the size of a filbert. Wood of the seeds of a dirty grey.

We have not heard of this plant in any English collection.

REDUVIA, in Surgery, a word used by some for a whitlow, and by others for a painful crack, or other disorder about the nails, either of the fingers or toes.

REDUX, in Chemiftry. See REDUCT.

REDWAETH BAY, or Treath Coeb, in Geography, a bay on the N. coaft of the island of Anglefey. N. lat. 53° 17’, W. long. 4° 25’.

REDWITZ, a town of Bavaria, in the bishopric of Bamberg; 4 miles N.W. of Künfadt. 

REDWITZ, a town of Germany, in the principality of Cülmach; 4 miles N. of Bayreuth.

REDWOOD RIVER, a river of America, which runs into the Wabash, N. lat. 40° 16’. W. long. 82° 15’. RED, or RE, in Commerce. See Mollusca.

REE, Lough, in Geography, an expansion of the waters of the river Shannon, in Ireland, between the county of Roscommon and the counties of Longford and Meath, reaching from Langborough nearly to Athlone, with several islands, and in some places three miles broad.

REED, in Botany. See ARUNDO.

The root of the arundo donax of Dioscorides, attracts any matter lodged in wounds, if powdered and applied to them with wine; or if it is taken fresh and reduced to powder with an onion, or mixed with honey. (Oribas de Morb. Cur. lib. ii. cap. 32.) It also removes pains arising from dislocation of limbs, and carries off pains in the hips. The green leaves cut and applied, are said to cure the erysipelas. Poor people boil the flowers in water or in beer, which they mix with honey, and drink, after being filtrated, to cure coughs, oppriffions of the breast, and consumptions. The ancients made flutes and other musical instruments of the reed. James’s Med. Dict.

REE, Barr. See SPARGANiUM.

REE, Indian flowering. See CANNA.

REE Mace. See TYPHA.

REE, in Agriculture, the name of an aquatic plant, infelting boggy lowlands or meadows on the sides of rivers.

The best method of destroying reeds, is by draining the land; for if the drains be cut deeper than their roots it will take away their nourishment, and, consequently, destroy them. Aches, or foot, will likewise sometimes kill them; and so will ploughing up the land, and laying it in high ridges. They always indicate a deep good moift soil, as a bad one will not nourish or support them. There are many different sorts of reeds, but those of the more vigorous and tall kinds are often of much ufe in thatching the different sorts of farm buildings, where other better kinds of coverings are scarce, and these abundant. There is also a sort of reed found in Huntingdonshire, and some of the adjoining counties, that is very valuable for the purpose of laying plaster floors with. In other situations, reeds of the other kinds may be met with, that may be found ufeful for different purposes either of the farmer or in the arts. In such situations they may be cultivated with advantage as an article of profit: and it may often be more beneficial than to have them destroyed, especially where they are of a valuable nature, and where the land is of too moift and boggy a quality to be ever fully reclaimed and brought into either the state of good arable or meadow ground. Slips on the sides of large rivers or brooks are likewise, frequently, the most advantageously, conveniently, and profitably kept under reed eeps, as the overflow of the waters prevent their being usefully managed in any other manner. There are other situations, as those about the borders of large ponds, lakes, and other waters, where they may be preferred with far greater propriety than having them destroyed, provided even that can be accomplished without difficulty, as not any thing more valuable can in general be raised in such places. They are, however, by no means to be continued wherever any better crop will grow and succeed.

REE is also a term applied to such straw of the wheat or rye kinds as has not been bruised by threshing or in any other way.

REE, Hedge, in Gardening, that sort of hedge fence which is formed from reeds. They are a sort of temporary internal fences made with these dried materials which may be had cheap, and be expeditiously formed into hedges by the affil-
R E E

ance of polt and railing, being of great utility for occasional use in gardens, to inclose particular internal spaces of ground, so as to afford shelter to certain feather plants, both in nurseries and large kitchen gardens; and in some nurseries, to form places of shelter for many sorts of feeding trees and shrubs, &c., which being tender whilst young, require the shelter of a fence in winter to break off severe or cutting blasts two or three years, till they gradually gather strength and a greater degree of hardiness. They are also useful in training several sorts of wall-fruit-trees against, to form them for rows, or what are called trained trees; adorning of planting trees against each side of them, fix, eight, or ten feet afunder. See Nursery.

And in large open kitchen-gardens they are occasionally made use of to inclose the melonary, or place for raising early melons and cucumbers in, and often as cross internal fences, under which to form warm borders for the purpose of raising various early crops of esculents.

The proper sort of reeds for these fences are the dried stems of the common marsh reed, which grows in great plenty by river sides, and in lakes, and marshy places, furnishing a crop of items annually fit to cut in autumn, when they should be bound in bundles, and stacked up, or houfed, to remain for use.

These fences are sometimes erected in fixed ranges, and sometimes formed into movable panels. In the first mode, some flat poles should be placed fix or eight feet afunder, and five or six fix, and from post to post carry two or three ranges of flat thin railing, one range near the bottom, another near the top, and a third in the middle; against this railing, the reeds must be placed about two inches thick, having other railing fixed directly opposite; so that the reeds being all along between the double railing, the bottom refting either upon a plate of wood, or let into the ground, but the former is preferable; and as soon as one panel is formed, the railing should be nailed as close as possible, driving some long spike-nails through each double railing, or binding them with strong withy bands, or tar rope-yarn, but railing is the best, in order to bring them as close as may be, to secure the reeds firmly in the proper position; the top should be cut even afterwards.

In the better method, a frame-work of railing should be prepared as above, each panel fix or eight feet long, and the reeds fixed therein as before directed; then, where they are intended to be placed, poles must be ranged fix or eight feet distant to support the different panels. Or sometimes the panels may be placed inclining against the wall or other fence, in time of severe weather, when the borders are narrow. These sorts of fences are now however in much less use in gardening than formerly.

Reed Ronds, in Rural Economy, a provincial word, signifying plots or beds of reed, or the swamps in which they grow.

Reed, Ezekiel's. See Ezekiel's Reed.

Reed, Calamus, likewise denotes a Jewish measure, otherwise called commea.

Reed, in the Manufactury of Tapestry. See Tapestry.

Reed Sparrow, in Ornithology. See Emberiza Schoeniclus.

Reed Point, in Geography, a cape on the W. coast of the island of Antigua. N. lat. 15° 12'. W. long. 61° 36'.

REEHAM. See REEPHAM.

REEDS, in a Fire-ship, are made up in small bundles of about twelve inches in circumference; cut even at both ends, and tied each with two bands. There are two kinds of them; the long, which are four feet; and the short, which are two feet five inches in length. Some of them are singly dipped, i.e., at one end, the reed are dipped at both ends, in a kettle of melted composition. After being immersed about seven or eight inches in this preparation, and then drained, they are sprinkled over with pulverized sulphur upon a tanned hide. See Fire-ship.

REEDSBOROUGH, in Geography. See REEDSBOROUGH.

REEDSTOWN. See STRONG.

REEDY CREEK, a river of New Jersey, which runs into the Atlantic, N. lat. 39° 55'. W. long. 74° 16'.

Reedy Island, an island of America, in the Delaware river, 50 miles below Philadelphia, and 20 miles from Bombay Hook, about three miles long and not more than one-fourth of a mile wide. This island was formerly banked in, but is now under cultivation, and overflowed in high tides. It is the rendezvous of outward-bound ships in autumn and spring; waiting for a fair wind. Here is a secure harbour at Port Penn, where piers have been erected by the State of Pennsylvania. On each side of the island is a channel; but veils, especially of the larger kind, choose to keep the eastern side.

Reedy River. See Saluda.

Reedy River Shoal, a post-town of America, in Greenfield county, South Carolina.

REEF (reef, Dutch), in Navigation, denotes a certain portion of a fail, comprehended between the top or bottom, and a row of eyelet-holes parallel to it. The intention of the reef is to reduce the surface of the fail in proportion to the increase of the wind; for which purpose there are several reefs parallel to each other in the superior fails, by which they may be still farther diminished, in order to correspond with the several degrees of the gale. The top-fails of ships are usually furnished with four reefs, parallel to the yard; and there are always three or four reefs parallel to the foot of those main-fails and fore-fails which are extended upon booms; a circumstance common to many of the small veils.

Falconer.

A bag-reef is the fourth, or lower, reef of a top-fail. A balance-reef crossed boom-main-fails diagonally, from thenock to the end of the upper reef-band on the after-larch. This is used to contract the fails in a block. Reef also denotes a chain of rocks, lying near the surface of the water.

Reed-Band, in Sea Language, a piece of canvas, fewed across the fail, to strengthen it in the place where the eyelet-holes of the reefs are formed.

Reef-Hanks, short pieces of log-line or other small line, fastened at certain distances to form the reefs of boom-fails.

Reef-Tackle, is a rope which passes from the deck to a block at the top-mast head, and thence to another block at the top-sail-yard-arm, where it communicates with another rope, called its pendant, that runs downwards through a hole in the yard, and is afterwards attached to a cringle, a little below the lowest reef. It is used to pull the skorts of the reefs clofe up to the extremities of the top-sail yards, in order to lighten the fail, the weight of which would otherwise render it very difficult to perform this operation.

Falconer.

Reef Island, in Geography, a small island in the East Indian sea, about 50 miles from the W. coast of Sumatra. S. lat. 4°. E. long. 101° 3'.—Albo, a small island in the East Indian sea, near the N. coast of the island of Celebes. N. lat. 5° 8'. E. long. 122° 48'.

Reefing, in Sea Language, the operation of reducing a fail, by taking in one or more of the reefs, which is performed by lines, points, or knittles. The top-fails are always
REEL, to reel ropes on from a six-thread ratline to a two-inch rope, have four ribs fixed at each end in a flat circular piece of wood; and round the edges are blades, or handles, to turn them: one of the circular pieces is called the head, and is made to slide off for taking the coil away. They turn on an iron spindle, and are from ten to thirty-six inches long, and from twelve to eighteen inches diameter. The Beach-reel used by fail-makers is similar to a spinning-wheel, and is used to expedite winding the twine from the skins to the twine-reel. Log-reels have several ribs fixed in a circular piece of board at each end, and turn or run upon a spindle, having a handle at one end. (See Log.) Twine-reels, used by fail-makers, are short cylindrical pieces of wood, hollowed in the middle to receive the twine, with a hole through the middle for the spindle. Those used by rope-makers have four oak bars, about eighteen inches long, framed together at the ends on a wooden spindle; one of the bars slides, for the convenience of taking off the twine. The Turn-reel consists of a circular board fastened horizontally on the middle of a piece of oak four inches square, and sixteen long, with a hole through its middle to receive a bolt, on which it turns as its axis, and is used to wind spun-yarn off the coil. The Hand-reel is a narrow board, with three or four holes at each end, in which pegs are fixed for reeling marline and other lines.

REELFOOT, in Geography, a small navigable river of America, in Tennessee, which discharges itself into the river Missippis, about 35 miles S. of the Ohio. It is 50 yards wide seven miles from its mouth. One of its branches rises on the borders of Kentucky.

REELING, in the Manufactories, the winding of thread, flax, cotton, or the like, into a skain, or upon a bottom, to prevent its entangling. It is also used for the charging or discharging of bobbins, or quills, to use them in the manufacture of different stuffs, as thread, flax, cotton, &c.

Reeling is performed different ways, and by different engines.

REEM, in Zoology. See RHINOCEROS UNICORNIS.

REEMING, a term used by caulkers for opening the seams of the planks with reeming-irons, that the oakum may be more readily admitted. To make any hole larger is also termed reeming.

REEMING-IRONS, are the largest irons used by caulkers in opening the seams.

REEMSTOWN, or REAMSTOWN, in Geography, a small poft-town of America, in Lancaster county, Pennsylvania, situated on a stream which runs into Calico creek, a water of Coneloga, which falls into the Susquehanna; 26 miles N.E. of Lancaster.

REEN, a river of Norway, in the province of Drontheim, which runs into the Glomme; 20 miles N. of Opfahl.

REIEN Mofa, a name used by some for the mountain coralloids, or rein-deer moss.

REENBERG, Theocarus, in Biography, a celebrated Danish poet, was born at Viborg in 1656, where he was educated. In 1680 he fell out on his travels into foreign countries, after having undergone an examination by the theological faculty, and he returned to Denmark in 1682. In 1723 he was appointed fourth judge in Jutland. In 1730 he became councillor of justice, and he died in 1742. His poetical works were published at Copenhagen in 1769, by his grandson Tichmann, with a preface by Kofod Anker, and annotations by Luxdorph. Gen. Biog.

REENS KLOSSER, in Geography, a town of Norway; 12 miles N.N.W. of Drontheim.

REEK, in Rural Economy, a term provincially used for flack. See Stack and Rick.

REEK-Stafford, a term applied to a frame of wood placed on flone, on which the mow or flack is railed. It is sometimes written Reek Stafford.

REEL, in the Manufactories, a machine serving for the office of reeling.

There are various kinds of reels; some very simple, others very complex. Of the former kinds, those most in use are,

1. A little reel, held in the hand, consisting of three pieces of wood, the biggest and longest whereof (which does not exceed a foot and a half in length, and a quarter of an inch in diameter,) is traversed by two other pieces disposed different ways.

2. The common reel, or windlace, which turns upon a pivot, and has four flights, traversed by long pins, or ficks, on which the skin to be reeled is put, and which are drawn clover or opened wider, according to the skin.

Other reels used in particular arts, are explained under their particular articles; as the reel used in milling of flax, under the article Milling; and that in the reeling or winding of flax, under the article Silk, &c.
RE-ENTERING ANGLE, in Fortification. See Angle, and Construction, according to M. Vauban's first method.

RE-ENTRY, in Law, the refuming or retaking that possession which any one had lately forgone.

As, if I make a leaf of land or tenement, I do thereby forego the possession; and if I condition with the leffe, that for no-payment of rent at the day, it shall be lawful for me to re-enter; this is as much as if I conditioned to take again the lands, &c. into my own hands, and to recover the possession by my own act, without the assistance of judge or other process. But words in a deed give no re-entry, if a clause of re-entry be not added. (Wood's Inft. 140.) All persons who would re-enter on their tenants for no-payment of rent, are to make a demand of the rent; and, to prevent the re-entry, tenants are to tender their rent, &c. (1 Inst. 201.) If there is a lease for years, rendering rent, with condition, that if the leffe affigns his term, the leffer may re-enter; and the leffe affigneth, and the leffer receiveth the rent of the affignee, not knowing or hearing of the affignment, he may re-enter, notwithstanding the acceptance of the rent. (3 Rep. 65. Cro. Eliz. 553.) See RENT. A feoffment may be made upon condition, that if the feoffor pay to the feoffee, &c. a certain sum of money at a day to come, then the feoffor to re-enter, &c. Litt. § 322. See Entry and Use.

REEPHAM, in Geography. See REPHAM.

REESE, REES, in Geography, a small island of Denmark, in the great Belt, near the coast of Zealand. N. lat. 54° 32' E. long. 11° 7'.

REESES, REIS, or REAS, in Commerce, monies of account in Portugal, 1000 of which make a milress or milrei.

In the notion of accounts, the milreis are separated from the rees by a crossed cypher, called "Cifraon," and the milreis from the millions by a colon; thus Rs. 2 : 700 500, means 2700 mil. and 500 rees. The cruafdo of exchange, or old cruafdo, is 400 rees; the new cruafdo, 480 rees; the telfoon, 100; the vintin or vintem, 20 rees. Thus the milrei is 31/2 old cruafdos, 2½ new ditto, 10 telfoons, or 50 vintins. The gold pieces, coined before 1722, are now 20 per cent. higher than their original value; so that the old dobras, coined at 20,000 rees, are worth 24,000; the librionnomes or mordeiros, coined at 4000 rees, are worth 4800; and the halves and quarters in proportion; but few of these coins are now in circulation. The gold coins, struck since 1722, are the dobra of 12,800 rees; the meia dobra, Joaenfe, or Portugal piece of 6400 rees; the half Joaenfe, of 3200; the dezefees telfoons, of 1600; the caratino, of 1200; the oito telfoons, of 800; the old cruafdo, of 400, now very scarce; and the new cruafdo, of 480 rees. The silver coins are new cruafados, of 480 rees; halves, quarters, and eighths, or pieces of 240,120, and 60 rees; telfoons of 100, and halves of 50; and vintins of 20 rees. There are also copper pieces of 10, 5, 3, and 1½ rees. The pieces coined in Brazil, called patacas, of 600 and 640 rees, are current only in that country, and their intrinsic value is 10 per cent. less than that of the Portugal coins. There is, besides, a gold milrei, struck for the Portuguese pofflfeffions in Africa, and also a silver coin, of the value of 12 macantas, or 600 rees; the macanta being a money of account, worth 50 rees. The Spanish patacas, or dollar, are reckoned at Lisbon at 830 rees, more or less.

Portuguese gold coins are 22 carats (the mark fine being 24 carats), wrought gold is 20½ carats, and gold dust from 21½ to 22 carats fine. The fineffes of silver is exprifed in dinheiros and grains, the mark fine being 12 dinheiros, and the dinheiro subdivide into 24 grains. Silver coins are

10 dinheiros 19 grains fine, and wrought silver 10½ fine.

The rate of coinage of gold and silver coins is as follows: 8 dobras of 12,800 rees, 16 Joanefes of 6400 rees, 32 half 10 Joanefes of 3200 rees, 64 dezfees teloons, 128 oito teloons, or 256 old cruafados, are to weigh a Portuguifhe mark of gold, 22 carats fine. Hence (the mark being 3542½ English grains) the dobra contains 442½ grains; the piece of 6400 rees 22½ grains of English fandard gold, and the other pieces in proportion. These coins, moreover, are not, in general, exactly 22 carats fine; but there is a remedy which amounts from 2½ to 3½ of a carat; and the new cruafados are found to be only 21½ carats fine. The silver coin is 10½ as above; and the mark is coined into 13½ new cruafados; hence the new cruafdo weighs 345½ Portuguese grains, or 265½ English grains; halves, quarters, and eighths, in proportion. It, therefore, contains 258½ grains of English fandard silver. The gold piece of 6400 rees is worth 355½ id. fterling; and the old cruafdo, 2½ id.; and thus the milrei, valued in gold, is worth 67½ fterling. The new filver cruafdo is worth about 2½ fterling; and, therefore, the milrei, valued in filver, is worth 69½ fterling. Gold is to filver as 16 to 1.

At Bombay each quarter of a rupee is divided into 100 rees. See Rupee.

REES, in Geography, a town of the duchy of Cleves; 8 miles E. of Cleves. N. lat. 51° 37'. E. long. 6° 20'.

Reesul Ain, or Refafna, a town of Asiatic Turkey, in the province of Daribekir; 80 miles S. of Daribekir.

REETZ, a town of the New Mark of Brandenburg; 50 miles N.E. of Cnutrin. N. lat. 53° 18'. E. long. 15° 56'.

REEVE, in Ornithology, the name of a bird which is the female of the avus pugnax; the male of which, from the long feathers round his neck, is called the ruff. See Tringa Pugnax.

Revee of a Church, is the guardian of it, or the churchwarden.

So fibre-reg is the sheriff, or guardian of a county; and port-reve, the warden of a port or haven.

REVEE-LAND. See Reveland.

REEVING, in the Sea Language, is the putting a rope through any hole, as the channel of a block, &c. Hence, to pull a rope out of a block, is called unreeving.

RE-EXCHANGE, in Commerce, a second payment of the price of exchange, or rather the price of a new exchange, due upon a bill of exchange that comes to be perfected; and to be refunded the bearer, by the drawer or indorser. See Exchange.

The occasion of re-exchange is, when the bearer of a bill of exchange, after protelting it, for want of either of acceptance, or of payment, borrows money on his own promise, bond, or the like; or draws a bill of exchange in the place where the payment was to be made, on the person who furnished the first for which he pays a second exchange; which, being added to the first already paid, the drawer of the first bill is answerable for two exchanges, properly called exchange and re-exchange.

The bearer of a protelfed bill has a right to recover both the one and the other on the drawer. Yet the simple protelation which the bearer makes in the act of protel, that he will take up a like sum at re-exchange, for want of his bill being accepted or paid, is not sufficient to entitle him to demand the reimbursement of his re-exchange, unless he makes it appear, that he has actually taken up money in the place on which the bill was drawn.

Otherwise the re-exchange will only amount to the restitution of the first exchange, with interest, the expenses of protelation, and those of the journey, if there have been any.
It a bill of exchange, payable to the bearer or order, come to be protested, the re-exchange is only due upon the drawer for the place where the remittance was made, not for those places where it may have been negociated; at least the drawer has a right to be refunded his re-exchange for those places by the indorser.

Indeed, the re-exchange is due from the drawer upon all places where a power of negociation is given by the bill; and upon all others, if the power of negociating be indefinite.

Lastly, the interest of the re-exchange, of the expenses of the protest, and the journey, are only due from the day of the demand.

It is supposed to be the Bibeliers driven out of Italy by the faction of the Guelphs, and sheltered at Amsterdam, who first established the custom of re-exchange, on pretense of the interrells, damages, and expences they underwent, when the bills given them for the effects they had been obliged to abandon, were not accepted, but came to be protested.

REFLECTORY, REFECTIO, among monks and ecclesiastics, a spare meal or repast, full sufficing for the support of life. Refection is also used, in Ancient Authors, for a duty or service incumbent on any person to provide meals for ecclesiastics, or even for princes.

REFECTORY, or REFECTUARY, Refftorium, a spacious hall in convents, and other communities, where the monks, nuns, &c. take their refestions or meals in common.

The refectory of the Benedicines of St. George at Venice, designed by Palladio, is one of the finest in the world.

Davier.

REFERENCE, in Writing, &c., a mark relative to another similar one in the margin, or at the bottom of the page, where something, omitted in the text, is added; and which is to be inserted either in reading or copying. A copyist must be very expert at taking references.

References are also used in books, where things being but imperfectly handled, the reader is directed to some other part or place where they are more amply explained.

Dictionaries are full of references, denoted by see or vide.

By means of these references the dictionary writer ferttles a correspondence between the several parts of his work, and may give his dictionary moiit of the advantages of a continued treatise.

Indices or tables are only references to the several parts of the work where the several matters are handled.

REFERENCE, in Law, denotes the sending of any matter by the court of chancery to a matter; and by the courts at law to a prothonotary, or seconday, to examine and report to the court. (2 Litt. Abr. 432.) If a matter in difference be referred to the seconday, and one of the parties will not attend at the time appointed, after notice given, to hear the business referred; the other party may proceed in the reference alone, and get the seconday to make his report without hearing of the party not attending. (2 Litt. 342.)

If a question of mere law arise in the course of a cause in chancery, or, whether, by the words of a will, an estate for life or in tail is created, or whether a future interest devised for a tail or tuller shall operate as a remainder on an executory devise: it is the practice of that court to refer it to the opinion of the judges of the court of king's bench, or common pleas, upon a cause stated for that purpose, in which all the material facts are admitted, and the point of law is submitted to their decision; who thereupon have it solemnly argued by counsel on both sides, and certify their opinion to the chancellor: and on such a certificate the decree is usually founded. It seems that the matter of the rolls, fitting for the chancellor, may make such reference; but not when fitting at the rolls. 2 Bro. C. C. 88.

The court of exchequer is both a court of law and of equity: therefore, if a question of mere law arises in the course of the exercise of its equitable jurisdiction, the barons will decide upon it in that suit, without referring it to another jurisdiction. Bl. Comm. 3.

REFERENDARY, REFERENDARIUS, in Ancient Customs, an officer who exhibited the petitions of the people to the king, and acquainted the judges with his commands.

An officer of this kind, Spelman observes, we had in England, in the time of the Saxons. The like office was afterwards discharged by others, called malters of requests.

REFINING, in Metallurgy and Assaying. In the former it signifies the metals of obtaining metals from their ores, and from any other impurities, natural or artificial: for which see the metals under their respective heads. In the latter it is employed for ascertaining the quantity of the noble metals in the different alloys; for which see CEPFL; where the methods of refining in the furnace are fully treated. And for the humid procès called paring, see GOLD.

It may be proper here to observe, that although the processes of paring by nitric acid is still practised, we are inclined to recommend the method proposed by Bergmann, which consists in dissolving the alloy of gold and silver in nitro-muriatic acid. The silver falls to the bottom in the estate of muriate of silver, and the gold is precipitated by the green sulphate of iron. The gold, by this means, is obtained perfectly pure, which is seldom the case in the processes of paring. The trouble of telling to know what silver to add to the alloy, to make the gold equal to one-fourth of the silver, will be baved, and, with heat, the nitro-muriatic acid dissolves the gold quite as soon as the silver is dissolved in the common method. The muriate of silver, which is easily separated by washing, may be readily reduced by heating it with soda in an iron crucible. The soda combines with the muriatic acid, and is sublimed in white fumes.

REFINING of Sugar. This operation is begun by several strong liquors or leys of lime-water and eggs, flulls and all, mixed and beaten together.

The first refining is performed in the Caribbees, and other places, where the sugar-canes are cultivated; and only serves to make the brown or coarse sugars.

When these are imported into Europe, the sugar-bakers take them up, and refine them farther, by a second operation, or rather a repetition of the first.

To render the sugar very fine, fit for confections, &c. they give it a third refining; in which they only use the whites of eggs and their shells beaten together, and thrown into the melted sugar; which is called clarifying the sugar. See SUGAR.

REFINING of Salt-petre. The salt being put into an earthen or iron vessel, as much spring-water is poured on it as suffices to dissolve it. The vessel is then put over a gentle fire; and as soon as the water begins to boil, alum powder is thrown into it: the proportion is, one pound of alum to one hundred and twenty-eight pounds of salt-petre; and a little vinegar is added. As it boils, the scum is to be taken off; and it is to be evaporated till a pellicle appears on it, and then set to coagulate. For
REF

For the refining of other matters, as camphor, cinnabar, sulphur, falt, borax, &c., see CAMPHOR, CINNABAR, SULPHUR, SALT, &c.

REFRITION VOE, in Geography, a bay on the E. coast of the island of Yell. N. lat. 65° 58'. W. long. 1° 25'.

REFITTING, in SEA LANGUAGE, denotes the repairing of any damages which a ship may have sustained in her sails and rigging, by battle or tempestuous weather.

REFLECTED RAY. See RAY.

REFLECTED VISION. See REFLEX and VISION.

REFLECTING, or REFLECTIVE DIAL, is a sort of dial, which shews the hour by means of a thin piece of looking-glass plate, duly placed to cast the sun's rays to the top of a ceiling, on which the hour-lines are drawn.

REFLECTING MICROSCOPE. See MICROSCOPE.

REFLECTING LEVEL. See LEVEL.

REFLECTING TELESCOPE. See TELESCOPE.

REFLECTION, or REFLEXION, in Mechanics, the return, or regressive motion of a moveable, occasioned by the reftance of a body, which hindered its pursuing its former direction.

It is controverted whether there be any moment's reft or interval between the incidence and the reflection. For the affirmative stand the Peripateticians, and all who conceive the reflected motion to be different from the incident one of the same body. The motion of incidence, according to these authors, is wholly loft, and destroyed, by the reftance of the obstacle struck against; and the moveable is thus rendered absolutely quiecent in the point of contact; till a new motion of reflection is produced in it, from a contrary cause.

The Cartesians affect the negative; absolutely denying any reft at all between the incidence and reflection; urging, that if the motion were once destroyed, though but for a moment, there would be nothing to excite it again; but the body would perforce in that new state, as much as if it had been at reft a thousand years.

Accordingly Rohault, and others, define reflection to be no other than a change of determination; or a continuation of the former motion in a new direction.

As, say they, a pendulum, when arrived at its greatest sweep, does not stop; so a hard body, by striking on another hard one, does not reft, but pursues its motion the contrary way, according to the established law of nature; and this from the immediate influence or impulse of the cause that first moved it. But this doctrine is now generally set aside.

Reflection is conceived, by the late Sir Babbage, as a motion peculiar to elastic bodies, whereby, after striking on others which they cannot remove, they recede, or turn back by their elastic power.

On this principle, it is asserted, that there may be, and is, a period of reft between the incidence and the reflection; since the reflected motion is not a continuation of the other, but a new motion, arising from a new cause or principle, viz. the power of elasticity.

It is one of the great laws of reflection, that the angle a reflected body makes with the plane of a reflecting obstacle, is equal to that in which it struck on that obstacle. For the several laws of motion observed in the reflections of bodies, see PERCUSSION.

Reflection of the rays of light, in Optics, is a motion of the rays, by which, after impinging on the solid parts of bodies, or rather, after a very near approach to them, they recede, or are driven from them.

When rays of light arrive at a surface, which is the boundary of two mediums not homogenous, they continue their progress without deviating from those planes in which their former paths lay, and which are perpendicular to the surface of the mediums, but they no longer retain the same direction, a part of them, and sometimes nearly the whole, being reflected back from the surface, while the remaining part is transmitted and refracted, or bent. No instance occurs of the abrupt change of the density of a medium, without a partial reflection of the light passing either into the denser, or into the rarer medium; and the more obliquely the light falls on the surface, the greater, in general, is the reflected portion. No body is so black as to reflect no light at all, and to be perfectly invisible in a strong light; although at the surface separating two very rare bodies, as two kinds of gas, the reflection is too faint to be perceptible; but in this case the separation is seldom perfectly abrupt. The quantity of light reflected, when other circumstances are equal, appears to be always greater when the difference of the optical or refractive density of the two substances is the greatest. Thus, the reflection from the common surface of glass and water is much weaker than from a surface of glass exposed to the air. Metals, in general, reflect a great proportion of the light falling on them; and even the reflection from the common surface of glasses and mercury appears to be but little weaker than the reflection from the surface of mercury immediately exposed to the air, so that the optical density of the metals must be exceedingly great. It appears, also, that a portion of the light falling on a reflecting surface, is always transmitted to a certain depth, notwithstanding the apparent opacity of any large masses of the substance. Thus, if we cover a small hole of a window-shutter with the thinnest leaf-gold, we shall find that it transmits a greenish light, which must have passed the reflecting surface, but which, if the gold had been one ten-thousandth of an inch thick, would have been wholly interrupted, and probably in the same manner as by passing through 700 feet of water. See LIGHT and REFRACTION.

The reflection of the rays of light from the surfaces of bodies, is the means by which bodies become visible.

And the disposition of bodies to reflect this, or that kind of rays most copiously, is the cause of their being of this or that colour.

The reflection of light from the surfaces of mirrors, makes the subject of CATOPTRICS; which see. See also MIRROR.

The reflection of light, for Isaac Newton has shewn, is not effected by the rays striking on the very parts of the body; but by some power of the body equally diffused throughout its whole surface, by which it acts upon the ray, attracting or impelling it without any immediate contact.

This power he shews to be the same, by which, in other circumstances, the rays are refracted; and by which they are at first emitted from the lucid body. See REFRACTION.

The arguments he produces to prove this are as follow: 1. Because the surfaces of polished glasses, which to the eye appear smooth, are yet, in reality, very rugged and uneven (polishing being nothing but the gratting, etching, and breaking off the coarser protuberances, by means of sand, glasses, putty, tripoli). If the rays of light, therefore, were reflected by striking on the solid parts of the glass, the reflections would never be so accurate as we find they are; but the rays would even be as much scattered by the most polished glasses, as by the roughest. It remains, therefore, a problem how glasses, polished by fretting substances, can reflect light so regularly as it does; which problem is fiercely otherwise to be solved, than by saying, that the reflection of a ray is effected, not by a single point of the
REFLECTION.

If the colours, separated by a prism placed at the entrance of a beam of light into a darkened room, be successively cast on a second prism placed at a greater distance from the former, in such manner as that they all fall alike, or with an equal obliquity, upon it; the second prism may be so inclined to the incident rays, that those which are of a blue colour shall be all reflected by it; and yet those of a red colour pretty copiously transmitted. Now, if the reflection were caused by the parts of the air or glafs, we would ask, why, at the same obliquity of incidence, the blue should wholly impinge on those parts so as to be all reflected; and yet, the red find pores enough to be, in a great measure, transmitted.

3. Where two glases touch one another, there is no sensible reflection; and yet we see no reason why the rays should not impinge on the parts of the glases, as much when contiguous to other glases, as when contiguous to air.

4. When the top of a water bubble, by the continual subliming and exhalation of the water, grows very thin, there is such a little, and almost in infinitely small quantity of light reflected from it, that it appears intensely black; whereas round about that black spot, where the water is thicker, the reflection is so strong, as to make the water seem very white. Nor is it only at the least thicknesses of thin plates or bubbles, that there is no manifest reflection, but at many other thicknesses, gradually greater and greater. For, in one of our author’s observations, the rays of the same colour were, by turns, transmitted at one thicknes, and reflected at another thicknes, for an intermediate number of successions: and yet, in the superficial of the thinned body, where it is of one thicknes, there are as many other parts for rays to impinge on, as where it is of any other thicknes.

5. If the red and blue rays, separated by a prism, fall successively on a thin plate of any pellucid matter, whose thicknes increases in continual proportion, (such as a plate of air between two glases, the one plane, and the other a little convex,) the same plate will, in the same manner, reflect all the rays of one colour, and transmit all those of the other; but, in different parts, will reflect the rays of one and the same colour at one thicknes, and transmit them at another; and thus alternately, and in infinitum. Now, it can never be imagined that at one place the rays, which, for instance, exhibit a blue colour, should happen to strike on the solid parts, and those which exhibit a red, to hit on the void parts of the body; and at another place, where the body is either a little thicker, or a little thinner, that, on the contrary, the blue should hit on the pores, and the red upon the solid parts.

In the passage of light out of glases into air, there is a reflection as strong as in its passage out of air into glases, or rather a little stronger, and by many degrees stronger than in its passage out of glases into water. Now, it seems improbable, that air should have more reflecting parts than water or glases: but if that should be supposed, yet it will avail nothing; for the reflection is as strong, or stronger, when the air is drawn from the glases by the air-pump, as when it is adjacent to it. If any should here object, on Descartes’s hypothesis, that, though the air be drawn away, there is a subtle matter remaining to supply its place, which, being of a denser kind, is better fitted for the reflection of light than any other body; besides that we have elsewhere shown such subtle matter to be fictitious, and that, supposing its existence, and its reflecting power, no light could ever have been propagated, but must have been all reflected back to the lucid body, immediately after it was first emitted, the following experiment does evidently convict it of fallacy.

7. If light, in its passage out of glases into air, strike more obliquely than at an angle of forty or forty-one degrees, it is then wholly reflected: if less obliquely, it is in great measure transmitted. Now, it is not to be imagined, that light at one degree of obliquity should meet with pores enough in the air to transmit the greater part of it; and at another degree should meet with nothing but parts to reflect it wholly; especially considering, that, in its passage out of air into glases, how oblique ever be its incidence, it finds pores enough in the glases to transmit a great part of it. If any suppo, that it is not reflected by the air, but by the utmost superficial parts of the glases, there is still the same difficulty: besides, that such a supposition is unintelligible, and will also appear to be false, by applying water behind some part of the glases, instead of air; for in a convenient obliquity of the rays, suppose of forty-five or forty-six degrees, at which they are all reflected, where the air is adjacent to the glases, they shall be in great measure transmitted where the water is adjacent to it; which argues, that their reflection or transmission depends on the constitution of the air and water behind the glases, and not on the striking of the rays upon the parts of the glases, the rays not being reflected until they have reached the last part of the surface, and have begun to go out. For if, in going out, they fall upon a surface of oil and water, they proceed, the attraction of the glases being balanced by an equal force the contrary way, and prevented from having its effect by the attraction of the liquor adhering to it; but if the rays, in passing out of this last surface, fall into a vacuum, which has no attraction, or into air, which has but little, not enough to counterbalance the effect of the glases in this case, the attraction of the glases draws them back, and reflects them.

This will appear still more evident by laying two glases prims, or the object-glases of two telescopes, the one plane, and the other a little convex, upon each other, so as they may neither touch, nor yet be too far apart; for that light which falls on the hinder surface of the first glases, where the glases are not above the part of an inch apart, will be transmitted through the surface, and through the air or vacuum between the glases, and will pass into the second glases; but if the second glases be taken away, then the light passing out of the second surface of the first glases into the air or vacuum, will not proceed, but will return into the first glases, and be reflected.

Whence it follows, that the rays are drawn back again by some force in the first glases, there being nothing else to occasion their return. And hence too it follows, that the reflection is not effected, by means of any subtle matter contiguous to the hinder surface, according to the principles of Descartes; since that matter ought to reflect them when the glases were nearly contiguous, as well as when the second glases was quite removed.

Lastly, if it be asked, how some of the rays come to be reflected, and others transmitted; and why they are not all alike reflected, supposing the reflection owing to the action of the whole surface? the same great author shews, that there are, both in the rays of light, and in the bodies themselves, certain vibrations (or some such property) impressed on the rays, by the action either of the luminary that emits them, or of the bodies that reflect them; by means of which it happens that these rays, in that part of their vibration which
which conspires with the motion of the parts of the body, enter the body, are refracted and transmitted; but those in a contrary part of their vibration are reflected.

Add, that every ray of light, in its passage through any refracting surface, is put into a certain transient constitution or state, which, in the progress of the ray, returns at equal intervals, and is deflected by the ray, at each return, to be easily transmitted through the next refracting surface; and between each return, to be easily reflected by it.

These alternate deflections, which Sir Isaac Newton calls a fit of easy reflection, and of easy transmission, he accounts for by supposing, that they are occasioned by the vibrations of a subtle fluid, in which the ray paffes, which happening to move fatter than the rays, when a ray is in that part of the vibration which conspires with its motion, it paffes through; but when in the contrary part of the vibration, it is beat back again: whence every ray is successively deflected to be easily reflected, or easily transmitted, by every vibration which overtake it.

He also thought that these vibrations might be excited by the mutual action and re-action of light, of bodies and of this medium, at the instant of reflection or refraction; so that, in fact, he supposes two causes of this deflection to be reflected or transmitted, when rays of light arrive at any new surface. One of them is the regular vibration of the etherial medium, affecting them through the whole of their progress from the luminous body; and the other the irregular motion, or irregular vibration of the same medium at the surfaces of bodies, occasioned by the action and re-action between light and them: for this last cause can hardly be supposed to affect the whole etherial medium equally, and produce the regular returns of these fits in every ray.

M. Boscovich supposes with Newton, that the fits of reflection or transmission affect the rays themselves, in the whole of their passage from the luminous body, but that they arise from an alteration in their form, by means of the elasticity of their component parts, having been originally driven from the luminous body by a force which acted more strongly on the hinder parts than on the rest of the mass, and thereby put them into a vibratory motion. He also supposes, that the intervals of the fits of easy reflection and transmission may be different in different rays, on the three following accounts. 1. The rays that are differently refrangible have different velocities, at least after refraction; so that, though the fits should return at equal intervals, it will affect different rays in different parts of their progress. 2. The unequal action between the points that compose the same particle of light may make a difference in their oscillations, at the time of changing their medium. And lastly, rays coming in different inclinations to the new surface, the internal motions of these points will be in different directions with respect to the surface, and consequently the whole mass of the medium will act upon all the points differently.


Upon the whole, says Dr. Priestley, is it not more probable that the rays of light are transmitted from the sun, with an uniform disposition to be reflected or refracted, according to the circumstances of the bodies on which they impinge; and that the transmission of some of the rays under the same circumstances, apparently, with others that are reflected, is owing to the minute vibrations of the small parts of the surfaces of the mediums through which the rays pass; vibrations that are independent of action and re-action between the bodies and the particles of light at the time of their impinging, though probably excited by the action of preceding rays. As to the transmission or reflection of certain kinds of light only, producing colours in thin plates, the cause may be this; viz. that every particle of the medium has a great number of equal alternate intervals of attraction and repulsion, relatively to the particles of light; but that these intervals are of different magnitudes, according as the particles of light are of different colours. Now the thickness of any transparent medium in which the particles of matter are uniformly placed is such, that the attracting intervals of the extreme particles, as well as the repelling intervals, coincide with one another, i.e. attracting with attracting, and repelling with repelling, in regard to any one kind of rays, e.g. the red; by the united force of their extremes, (all the intermediate particles of the medium mutually destroying each other's effects,) these rays will be reflected. But where the plate is of an intermediate thickness between this and the next thickness, where the attracting intervals coincide, attracting with attracting, and repelling with repelling, the attracting intervals will coincide with the repelling ones, and the repelling ones with the attracting ones, and these mutually destroying one another's effects, these rays will pass on freely, and be transmitted. But as the intervals of attraction and repulsion are different for differently coloured rays, the thicknesses of the plates at which these coincidences will or will not happen, in the differently coloured rays, will be different. So that it appears probable, says Dr. Priestley, in conformity to a doctrine first suggested to him by Mr. Michell, that the whole mystery of coloured plates depends upon the attractions and repulsions of the particles of the bodies that compose them, affecting different rays in a different manner, according to their thicknesses. See Colours, &c. of Light and Colours, p. 309, &c. See Colours of thin Lamins, &c. and RINGS OF Colours.

Sir Isaac Newton concludes his account of the reflection of light with observing, that if light be reflected not by impinging on the solid parts of bodies, but by some other principle, it is probable that as many of its rays as impinge on the solid parts of bodies are not reflected, but filleted and lost in the bodies. Otherwise, he says, we must suppose two kinds of reflection; for should all the rays be reflected which impinge on the internal parts of clear water or crystal, thole substances would rather have a cloudy colour than a clear transparence. To make bodies look black, it is necessary that many rays be stopped, retained, and lost in them; and it does not seem probable, that any rays can be stopped and filleted in them, which do not impinge on their parts: and hence, he says, we may understand, that bodies are much more rare and porous than is commonly believed. However, M. Bouguer disputes the fact of light being filleted or lost by impinging on the solid parts of bodies. See Absorbing.

For other facts and observations relating to the subject of this article, see Light. See also RAYS OF LIGHT, and RAYS OF HEAT.

Reflection, in Catoptrics, is the return of a ray of light from the polished surface of a speculum or mirror, as driven thence by some power refiding in it.

The ray, thus returned, is called a reflex, or reflected ray, or a ray of reflection; and the point of the speculum, whence the return commences, is called the point of reflection.

Thus the ray A B (Plate I. Optics, fig. 3.), proceeding from the radiant A, and striking on the point of the speculum B, being returned thence to C, B C represents the reflected ray, and B the point of reflection; in respect of which A B represents the incident ray, or ray of incidence, and B the point of incidence.

Again, a line CG drawn from any point, as C, of the reflected
Reflection.

Reflected ray \( BC \), perpendicular to the speculum, is called the cathetus of reflection, or cathetus of the eye: as a line \( \text{AF} \), drawn from the radiant perpendicular to the speculum, is called the incidence.

Of the two angles which the reflected ray \( BC \) makes with the mirror, the smalleft, \( CBE \), is called the angle of \text{reflection} as of the two angles the incident ray makes with the speculum, the smalleft, \( ABD \), is called the angle of \text{incidence}.

If the mirror be either concave or convex, the smalleft angles the ray makes with the tangent to the point of reflection and incidence, are the angles of reflection and incidence.

The angle \( CBH \), which the reflected ray makes with a perpendicular to the point of reflection, is called the inclination of the reflected ray: as the angle \( A BH \) is called the inclination of the incident ray.

Reflection, general laws of.—I. If a ray of light be reflected from a speculum of any form, the angle of incidence is ever equal to the angle of reflection. This law obtains in per- cussions of all kinds of bodies; and consequently must do so in those of light. See \text{Laws of Percussion}; see also Angle.

It might therefore be here assumed as an axiom: but it is of that importance, and its demonstration is beautiful, that we cannot omit it. Suppose, then, \( \text{DC} \) (Plate XVII. \text{Optics}, \text{fig.} 14.) an incident ray, propagated from the radiant \( D \): here, though the motion of the ray be simple, yet its determination in the line \( \text{DC} \), being oblique with respect to the oblique, is really compounded of two determinations; one along \( DE \), the other along \( D G \).

The force along \( \text{DC} \), therefore, is equal to the two forces along \( DG \) and \( DH \). But the oblique \( GF \) only opposes one of the determinations; viz. that along \( DG \) (for it cannot oppose a determination parallel to itself, as \( DE \)): therefore, only the force along \( DG \) will be lost by the stroke, that along \( DH \) or \( GC \) remaining entire. But a body perfectly elastic (such as we suppose the ray of light) will recover by its elasticity the force it lost by the shock.

The ray, therefore, will recover the force \( DG \) or \( CH \); thus, retaining both its forces, and both its former determinations \( HC \) and \( CF \), after percussion, it will be impelled along \( CF \) and \( CH \) by the fame forces as before along \( DH \) and \( DG \). By its compound motion, therefore, it will describe the right line \( CE \), and that in the same time as \( DC \); and \( HE \) and \( DH \) will be equal, as being described by the same force. Now, the two triangles \( DCH \) and \( CHE \) are equal, and consequently their similar angles are equal. Since then \( HCA = HCF \); \( DCA \), the angle of incidence, is equal to \( ECF \), the angle of reflection. Q. E. D.

This law is confirmed in light by an easy experiment. For a ray of the sun falling on a mirror, in a dark room, through a little hole, you will have the pleasure to see it rebound, so as to make the angle of reflection equal to that of incidence. See \text{Camera Obscura}.

The fame may be shewn various other ways: thus, e.g. placing a femeircle \( FG \), (Plate I. \text{Optics}, \text{fig.} 3.) on a mirror \( DE \), its centre on \( B \), and its limb perpendicular to the speculum; and assuming equal arcs, \( FA \) and \( GC \), place an object in \( A \), and the eye in \( C \); then will the object be seen by a ray reflected from the point \( B \). And if \( B \) be covered, the object will cease to be seen.

For the conclusions drawn from this general doctrine of reflection, see the \text{doctrine of Mirrors}, &c.

II. Each point of a speculum reflects rays falling on it, from each part of an object. See the \text{doctrine of Mirrors}, &c.

III. If the eye \( C \), and the radiant point \( A \), change places, the point will continue to radiate upon the eye, in the same course or path as before.

For if the object be removed from \( A \) to \( C \), it will still radiate on its former point of reflection, \( B \); but there can be but one right line drawn between the two points \( G \) and \( D \); and the rays are right lines. Therefore, that which was before the ray of reflection, will now be the ray of incidence; and since it will be reflected under the same angle as that under which it fell, that which was before the ray of incidence, will now be the ray of reflection. So that the object removed to \( C \), will radiate on the eye placed in \( A \), by the right lines \( CB \) and \( BA \). Q. E. D.

Hence, an object is seen by the reflected ray \( AB \), with the eye placed in \( A \), the same as if the eye were in \( C \), and the object in \( A \).

The truth of this theorem is so easily confirmed by experiment, that some, with Euclid, assume it as a principle, and demonstrate the great law of reflection from it. Thus: suppose the angle of incidence a little greater than the angle of reflection, then will the angle \( AFB \) be greater than \( CBE \). Wherefore, changing the places of the eye and the object, the angle \( CBE \) will become the angle of incidence; and therefore \( CBE \) greater than \( AFB \), by the supposition. So that the same angle \( AFB \) will be both greater and smaller than the other, \( CBE \); which being absurd, \( AFB \) cannot be greater than \( CBE \). The same absurdity will follow, if you suppose the angle of incidence less than the angle of reflection. Since then the angle of incidence can neither be greater nor less than that of reflection, it must be equal to it.

IV. The plane of reflection, that is, the plane in which the incident and reflected rays, and also the angles of incidence and of reflection, are found, is perpendicular to the surface of the speculum; and in spherical specula, it passes through the centre.

Hence the cathetus, both of incidence and reflection, is in the plane of reflection.

That the plane of reflection is perpendicular to the speculum, is affirmed by Euclid, Alhazen, and others, as a principle, without any demonstration; as being evident from all observation and experiment.

V. The image of an object seen in a mirror is in the cathetus of incidence. This the ancients affirmed as a principle; and hence, since the image is certainly in the reflected ray, they inferred, it must appear in the point of concourse of the reflected ray, with the cathetus of incidence; which indeed holds universally in plane and spherical mirrors, and usually also in concave ones, a few cafes only excepted, as is shewn by Kepler.

For the particular laws of reflection, arising from the circumstances of the several kinds of specula, or mirrors, plane, concave, convex, &c. see them laid down under the article \text{Mirror}.

Reflection, Caustic by. See \text{Caustic Curve}.

Reflection of Heat. See \text{Heat}, and \text{Rays of Heat}.

Reflection of Cold. See \text{Cold}.

Reflection of Sound. See \text{Sound}.

Reflection of the Moon, is a term used by some authors for what we otherwise call \text{her variation}, being the third inequality in her motion, by which her true place out of the quadratures differs from her place twice equated. See \text{Moon and Variation}.

Reflection is also used, in the Copernican system, for the distance of the pole from the horizon of the disc; which
Reflection is also used figuratively for an operation of the mind, by which, turning as it were upon itself, it makes itself, and its own operation, its object; and considers or contemplates the manner, order, and laws, which it observes in perceiving, reasoning, willing, judging, doubting, believing, &c. and frames itself new ideas of the relations discovered in them.

Reflectoire Curve. See Curve Reflectoire.

REFLECTOR for Light-houses, a combination of a number of square plane glass mirrors, resembling those with which Archimedes is said to have burnt the Roman fleet at the siege of Syracuse. (See Burning-Glafs.) Each of these mirrors is about an inch square; and they are all arranged close to each other in the concave of a parabolic segment formed of stucco, which has been found to answer the purpose best. The idea of thus illuminating light-houses, instead of using coal-fires, in this country, without any previous knowledge of a similar method practiced in France, was first suggested by Mr. Ezekiel Walker, of Lynn Regis, who made, and fixed up reflectors under his direction, in a light-house on the coast of Norfolk, in the year 1779. Accordingly, in the year 1787, at the request of the trusts appointed by act of parliament for erecting four light-houses in the northern parts of Great Britain, he instructed Mr. Thomas Smith, tin-plate worker, of Edinburgh, to whom the original invention was erroneously ascribed in the supplement to Encyclopædia Britannica, in this mode of constructing light-houses. His parabolic moulds are from three to five or six feet in diameter; and in the centre or apex of each is placed a long hollow lamp of tin-plate, filled with whale-oil. In each lamp are fix cotton-wicks, almost contiguous to one another, disposed as to burn without trimming for six hours. The light of these is reflected from each mirror spread over the concave surface, and is thus multiplied, as it were, by the number of mirrors. The stucco moulding is covered on the back with tin-plate, from which a tube, immediately over the lamp, proceeds to the roof of the light-room, and serves as a funnel, through which the smoke escapes without fullying the faces of the mirrors. The light room is a cupola or lantern of from eight to twelve sides, composed entirely of glass, fixed in cast iron frames or sashas, and roofed with copper. On circular branches passing round the inside of this lantern, at about 18 inches from the glass frames, are placed the reflectors with their lamps, so as that the concave surfaces of two or three of the reflectors from every point of the compass, throw a blaze of light in all directions. In the roof, immediately over the centre of the room, is a hole, through which pass all the funnels already mentioned, and which serves likewise to admit fresh air to the lamps. This light-room is firmly fixed on the top of a round tower, so as to be immovable by the weather; and the number of the reflectors, and the height of the tower, arc less or greater according as it is intended that the light should be seen at a less or a greater distance. Experience, it is said, has obviated several objections to which light-houses of this kind were thought to be liable; and it has been found that light-houses, with lamps and reflectors, are, in every point of view, preferable to those with fires burning in the air. They are supported at a much less expense; their light is more brilliant, and seen at a greater distance, whilst it can never be obscured by smoke, or beaten down, on the ice, by a violent gulf of wind; and they may be so variously placed, that one light-house cannot be mistaken for another. Besides, the lamps do not need trimming so often as open fires require fuel, and the man who attends them is never exposed either to cold or wet in the performance of his duty, so that they are less likely to be neglected in stormy weather than those with open fires.

It has been proposed to make the concave surface of the parabolic one speculum of metal, instead of covering it over with a number of plain glass mirrors; or to diminish the size of each mirror, if it be thought best to retain them instead of introducing the speculum. To this proposed alteration it has been objected, that the brightest metal does not reflect such a quantity of light as well foliated clear glass; and by diminishing the size of the mirrors, the number of joinings would be increased, in each of which some light is lost, not merely in the beam, but from its being almost impossible to foliate glass perfectly at its edge.

REFLEX, REFLECT, in Painting, is understood of those places in a picture which are supposed to be illuminated by a light reflected from some other body represented in the same piece.

Or, reflexes may be defined those places which, beside the general light that illumines the whole piece, receive some particular light from their situation with respect to some more illuminated polished body, that reflects part of the rays it receives upon them.

Reflexes are scarcely sensible, except in the shadowed parts. The management of the reflexes requires great accuracy and skill. All reflected light is supposed to carry with it part of the colour of the body which reflects it; so that those places which receive this light, must have their colour mixed or tinged with that colour. But the same place may receive reflexes from different objects, differently coloured, and those again receive reflexes from others. The painter, therefore, must have a view to every circumstance of the colour, light, and position of each figure; he must consider what effect each has on others, and pursue nature through all the variety of mixtures. See CLAIR-OBSCURE, and LIGHT.

REFLEX VISION, or REFLECTED VISION, is that performed by means of rays reflected from the polished surfaces of objects to the eye.

Reflex vision is the subject of catoptrics. Under reflex vision come all the phenomena of specula or mirrors of all kinds.

REFLEXIBILITY of the Rays of Light, is that property by which they are disposed to be reflected. See Reflection.

Or, it is their disposition to be turned back into the same medium, from any other medium on whole surface they fall; hence those rays are said to be more or less reflexible, which are returned back more or less easily under the same incidence.

Thus, if light passes out of glass into air, and by being inclined more and more to the common surface of the glass and air, begins at length to be totally reflected by that surface, those sorts of rays which at like incidences are reflected most copiously, or the rays which, by being inclined, begin soonest to be totally reflected, are the most reflexible rays.

That rays of light are of different colours, and endowed with different degrees of reflectibility, was first discovered by sir Isaac Newton; and is shewn by the following experiment.

Applying a prism D F E (Plate XVII. Optics, fig. 15), whose angles are each 45°, to the aperture C of a darkened room, in such manner that the light is reflected from the base in G; the violet rays are seen first reflected into H G; the other rays continuing still refracted in I K. After the violet the blue are all refracted, the green, &c. (See
REFRANGIBILITY. See Reflection.

REFLEXION. See Reflection.

REFLEXITY, a term employed by Mr. Brougham to denote a property of light, which causes the different rays to be acted upon by bodies, and to begin to be refracted, reflected, refracted, and deflected, at different distances. This property observes the same law with the other optical properties of light; the red ray having most reflectivity, and the violet the least. (See Phil. Trans. for 1797, p. 360.) Mr. Brougham has expressed this property by the three words, "refraction," "reflexity," and "flexity," but the power being the same, if such a property exist, different names seem to be unnecessary.

REFLUX of the Sea, the ebbing of the water; or its return from the shore. It is thus called, as being the opposite motion to the flood, or flux. See Tide.

REFORM, a re-establishment, or revival of former neglected discipline; or a correction of some reigning abuses in it.

The term is much used in a monastic sense, for the reducing or reformation of religious to the ancient severity of the rule from which it had gradually swerved; or even for the improving on the ancient rule and institution itself, and voluntarily making it more severe.

In this sense the order of St. Bernard is said to be only a reform of that of St. Benedict.

To Reform, in a Military Sense, is, after some evolution or manoeuvre, to bring a line to its natural order, by aligning it on some given point. See Battalion.

To Reform, is also to reduce a company, regiment, or other body of men, either by disbanded the whole, or only breaking a part, and retaining the rest; or sometimes by incorporating them with other regiments. Hence, REFORMADO, or Reformed officer, one whole troop or company is suppressed in a reform, whilst he is continued either in whole or half-pay, doing duty in the regiment. A reformed captain of foot follows the company, and affixes the standing officer as a second; but he still maintains his degree and precedence.

REFORMATION, Reformatio, the act of reforming, or correcting an error, or abuse, in religion, discipline, or the like.

The reformation of religion, called, by way of eminence, the Reformation, was begun by the elector of Saxony, at the solicitation of Luther, about the beginning of the sixteenth century. See Luther and Lutheranism.

There were many circumstances which concurred at this time to bring about that happy reformation in religion, which rescued one part of Europe from the papal yoke, mitigated its rigour in the other, and produced a revolution in the sentiments of mankind, the greatest as well as the most beneficial that has happened since the publication of Christianity. How far the sale of indulgences, published by Leo X., contributed to this event, we have already seen under the article Luther. We shall here observe, that the fame corruptions in the church of Rome which Luther condemned, had been attacked long before his appearance, and the same opinions which he propagated had been published in different places, and supported by the fame arguments. Waldus in the 12th century, Wickliffe in the 14th, and Hufa in the 15th, had inveighed against the errors of Popery with great boldness, and confuted them with more ingenuity and learning than could have been expected in those illiterate ages in which they flourished. But all these premature attempts towards a reformation proved abortive. Many powerful causes contributed to facilitate Luther's progress, which either did not exist, or did not operate with full force in their days: the principal of these we shall here enumerate. The long and scandalous schism which divided the church, during the latter part of the 14th, and the beginning of the 15th centuries, had a great effect in diminishing the veneration with which the world had been accustomed to view the papal dignity. The proceedings of the councils of Constance and Basil spread this disrespect for the Romish see still wider, and by their bold exertion of authority in depoping and electing popes, taught the world that there was in the church a jurisdiction superior even to the papal power, which they had long beloved to be supreme. The wound given on that occasion to the papal authority was fearcely healed, when the pontificates of Alexander VI. and Julius II. both able princes, but detestable ecclesiastics, raised new scandal in Christendom. Besides, many of the dignified clergy, secular as well as regular, neglected the duties of their office, and indulged themselves, without reserve, in all the vices to which great wealth and idleness naturally give birth; and gross ignorance and loud debauchery rendered the inferior clergy as contemptible as the others were odious. So that we find, long before the 16th century, that many authors of reputation give such description of the dilolute morals of the clergy, as seems almost incredible in the present age. The scandal of those crimes, which very generally prevailed, was greatly increased by the facility with which such as committed them obtained pardon. The exorbitant wealth of the church, the vast personal immunities of ecclesiastics, and their encroachments on the jurisdiction of the lay, and their various devices to secure their usurpations, created much dissatisfaction among the people, and disposed them to pay particular attention to the invectives of Luther. Besides these causes of his rapid progress, we may also reckon the invention of the art of printing, about half a century before his time, the revival of learning at the same period, and the bold spirit of inquiry which it excited in Europe; so that many were prepared to embrace his doctrines, who did not really with success to his undertaking. In the writings of Reuchlin, Hutten, and the other revivers of learning in Germany, the corruptions of the church of Rome are censured with an acrimony of style little inferior to that of Luther himself. The railery and oblique cen
tures of Erasmus in particular, upon the errors of the church, as well as upon the ignorance and vice of the clergy, prepared the way for Luther's invectives and more direct attacks. To all which we may add, that the theological doctrines of Popery were so repugnant to the spirit of Christianiety, and so detestable; any foundation in reason, in the word of God, or in the practice of the church, that this circumstance combined in favouring the progress of Luther's opinions, and in weakening the resistance of his adversaries. The rise of the reformation in Switzerland was a least as early as in Germany; for Ulric Zwingli had, in the year 1516, begun to explain the scriptures to the people, and to confute, though with great prudence and moderation, the errors of a corrupt church. He had very noble and extensive ideas of a general reformation, at the time when Luther retained almost the whole system of Popery, indulgences excepted; and he had actually called in question the authority and supremacy of the pope, before the name of Luther was known in that country. In the year 1524, Nuremberg, Franckfort, Hamburg, and several other cities in Germany, of the first rank, openly embraced the reformed religion, and by the authority of their magistrates abolished the
the masts, and the other superstitious rites of Popery. The elector of Brandenburgh, Saxony, the marquis of the landgrave of Hesse, the dukes of Brunswick and Luneburgh, and prince of Anhalt, became avowed patrons of Luther's opinions, and countenanced the preaching of them among their subjects. The reformers derived great advantage from the transactings of the diet at Nuremberg, which preferred to the pope a catalogue of a hundred grievances, which the empire imputed to the iniquitous dominion of the papal see. The progress of the reformation in Germany was likewise promoted by the proceedings of the diet held at Spire in the years 1526 and 1529. See Luther and Protestants.

During these transactings in Germany, the dawn of truth arofe upon other nations. The light of the reformation spread itself far and wide; and at length all the European states welcomed its salutary beams, and exulted in the prospect of an approaching deliverance from the yoke of superstition and spiritual despotism. Some of the most considerable provinces of Europe had already broken their chains, and openly withdrawn themselves from the discipline of Rome and the jurisdiction of its pontiff. The reformed religion was propagated in Sweden, soon after Luther's rupture with Rome, by Olaus Petri, one of his disciples, who was countenanced and encouraged by the valiant and public-spirited prince Gustavus Vasa Ericson, to whose firmness and magnanimity it was owing, that from the year 1527 the papal empire in Sweden was entirely overthrown, and Gustavus declared head of the church. The light of the reformation was also received in Denmark fo early as the year 1521, in consequence of the ardent desire discovered by Christian and Christian II., for purposes of mere ambition, of having his disciples instructed in the doctrines of Luther. His successor Frederic, duke of Holstein and Silicia, contributed greatly to the progress of the reformation, by his successful attempts in favour of religious liberty, at the assembly of estates that was held at Odensee, in the year 1527, when he procured the publication of the famous edict which declared every subject of Denmark free, either to adhere to the tenets of the church of Rome, or to embrace the doctrine of Luther; that no person should be molested on account of his religion; that a royal protection should be granted to the Lutherans; and that ecclesiastics of every order should be allowed to marry. But the honour of accomplishing this glorious work was reserved for Christian III., a prince equally distinguished by his piety and prudence. The religious doctrine, discipline, and worship of this kingdom, were settled according to a plan laid down by Bugenhagius. And the assembly of the estates at Odensee, in 1539, gave a solemn sanction to all these transactions, and thus the work of reformation was brought to perfection in Denmark.

In France, the auspicious patronage of Margaret, queen of Navarre, sister to Francis I., encouraged several pious and learned men, whose religious sentiments were the same with her own, to propagate the principles of the reformation, and even to erect several Protestant churches in that kingdom. It appears, that, so early as the year 1523, there were many, and even persons of rank, and some of the episcopal order, who had conceived the utmost aversion both against the doctrine and tyranny of Rome. But the wavering and inconsistent conduct of Francis I. rendered the situation of the Protestants in this country always precarious, often disconcerted. Upon the whole, we may observe, that, before the diet of Augsburg, the doctrine of Luther had made considerable, though perhaps a secret, progress in Spain, Hungary, Bohemia, Britain, Poland, and the Netherlands, and had, in all these countries, many friends, of whom several repaired to Wittenberg to improve their knowledge, and enlarge their views under such an eminent master. At this diet, held in 1530, the Augsburg or Augsburg Confession was presented to the emperor Charles V. and after many debates between the friends of liberty and the vassals of Rome, the latter prevailed; and the diet, in compliance with the opinion and remonstrances of Campeggio, the papal nuncio, issued a decree, condemning most of the peculiar tenets held by the Protestants; forbidding any person to protect or tolerate those who taught them; enjoining a strict observance of the established rites; and prohibiting any further innovation, under severer penalties. Those who refused to obey this decree were declared incapable of acting as judges, or of appearing as parties in the imperial chamber, the supreme court of judicature in the empire. The Protestants, alarmed at the severity of the decree, assembled at Smalcald, and concluded a league of mutual defence against all aggressors, by which they formed the Protestant states of the empire into one regular body; and they resolved to apply to the kings of England, France, and Denmark, to implore them to affift and patronize this new confederacy. After various negotiations between the emperor and the Protestant princes, terms of pacification were agreed upon at Nuremberg, and ratified solemnly in the diet of Ratibon, in the year 1532. In this treaty it was stipulated, that universal peace should be established in Germany; until the meeting of a general council, the convocation of which, within six months, the emperor threatendeavour to procure; that no person should be molested on account of religion; that a stop be put to all proceedings begun by the imperial chamber against Protestants; and the sentences already passed to their detriment be declared void. On their part, the Protestants engaged to assist the emperor with all their forces in repulsing the invasion of the Turks. Thus the Protestants, by their firmness, unanimity, and dexterity in availing themselves of the emperor's situation, obtained terms which amounted almost to a toleration of their religion.

But neither the emperor nor the pope were disposed to abide by the unbiased sense of a general council, assembled, as the Protestants wished, within the limit of the empire, but determined to decide their religious debates by the force of arms. After many evasions and delays, it was proposed, in the year 1545, to assemble a council at Trent, which was vigorously opposed by the Protestants. The emperor and the pope had mutually agreed to destroy all who should dare to oppose this council. The meeting of that assembly was to serve as a signal for their taking arms; and accordingly its deliberations were speedily begun, in the year 1546, when the Protestants perceived undoubted marks of a formidable union to overthrow and crush them by one blow. The fathers, assembled in the council of Trent, promulgated
their decrees; and the Protestant princes in the diet of Ratisbon protected against their authority; and were, in consequence of this, proscribed by the emperor, who raised an army to reduce them to obedience. Thus commenced the war of Smalcald, which was prosecuted with various successes on both sides, till, in the year 1552, Charles was surprised at Inpruck by Maurice of Saxony, and was constrained to conclude at Passau the famous treaty of pacification, (which fee,) with the Protestants, which is confined by those of Germany as the basis of their religious liberty; and to promise in six months to assume a diet, in which all the tumults and dissensions, that had been occasioned by a variety of sentiments in religious matters, should be entirely removed. This diet, though not assembled at the stipulated time, met, however, at Augsburg, in the year 1555, and terminated those deplorable scenes of bloodshed, delusion, and discord, that had so long afflicted both church and state by that religious peace, as it is commonly called, which secured to the Protestants the free exercise of their religion, and established this inestimable liberty upon the firmest foundations. For, after various debates, the following memorable acts were passed; that the Protestants who followed the confession of Augsburg, should for the future be considered as entirely exempted from the jurisdiction of the Roman pontiff, and from the authority and superintendence of the bishops; that they were left at perfect liberty to enact laws for themselves, relating to their religious sentiments, discipline, and worship; that all the inhabitants of the German empire should be allowed to judge for themselves in religious matters, and to join themselves to that church whose doctrine and worship they thought the purest and most consonant to the spirit of Christianity; and that all those, who should injure or persecute any person under religious pretences, and on account of their opinions, should be declared, and proceeded against, as public enemies of the empire, invaders of its liberty, and disturbers of its peace.

In the year 1553, Henry VIII. king of England, who, in the beginning of these troubles, had opposed the doctrine and views of Luther with the utmost vehemence, partly because he had spoken with contempt of Thomas Aquinas, the king's favourite author, having sued for a divorce from Catharine of Aragon, his brother's widow, at the court of Rome, for almost six years, during which period Clement VII. negotiated, promised, retracted, and concluded nothing, determined to apply to another tribunal for that decree which he had unsuccessfully solicited at Rome. Cramer, archbishop of Canterbury, by a sentence founded on the authority of universitieS, doctors, and rabbies, who had been consulted with respect to the point, annulled the king's marriage with Catharine; and Anne Boleyn, whose charms had captivated the king, was acknowledged as queen of England. Clement, apprehensive lest England would revolt from the holy see, determined to give Henry such satisfaction as might still retain him within the bosom of the church. But the violence of the cardinals precipitated him, in 1534, to issue a bull revoking Cramer's sentence, confirming Henry's marriage with Catharine, and declaring him excommunicated, if, within a time specified, he did not abate the wife he had taken, and return to her whom he had defected. Enraged at this unexpected decree, Henry kept no longer any measures with the court of Rome; his subjects sided his rebellion; an act of parliament was passed, abolishing the papal power and jurisdiction in England; by another the king was declared supreme head of the church, and all the authority of which the popes were deprived was vested in him; the monasteries, (which fee,) were suppressed, and their revenues applied to other purposes.

The people had been gradually prepared for this great innovation. Each succeeding feccion of parliament had made some retrenchment from the power and profits of the Roman pontiff. Care had been taken, during some years, to teach the nation that a general council was much superior to a pope. But now a bishop preached every Sunday at Paul's Cross, in order to inculcate the doctrine, that the pope was intitled to no authority at all beyond his own diocese.

The laws passed during this session (1534) sufficiently evince, that the king was determined not to surrender any part of his afoomed prerogative. All payments made to the apostolic chamber: all provisions, bulls, dispensations, were abolished: monasteries were to be subjected to the regulation and government of the king alone: the law for purifying heresies was moderated: the ordinary was prohibited from imprisoning or trying any person upon suspicion alone, without presentment by ten lawful witnesses; and it was declared that to speak against the pope's authority was no hereby: bishops were to be appointed by a couc el d'elire from the crown, or, in case of the dean and chapter's refusal, by letters patent; and no recourse was to be had to Rome for bulls, bulls, or provisions. Campeggio and Ginucci, two Italians, were deprived of the bishoprics of Salisbury and Worcester, which they had hitherto enjoyed: the law which had been formerly made against paying annats, or first fruits, but which had been left in the king's power to suspend or enforce, was finally established: and a submision which was exacted two years before from the clergy, and which had been obtained with great difficulty, received this session the sanction of parliament. In this submision, the clergy acknowledged that convocations ought to be assembled by the king's authority only: they promised to enact no new canons without his consent: and they agreed that he should appoint 32 commissioners, in order to examine the old canons, and abrogate such as should be found prejudicial to his royal prerogative. An appeal was also allowed from the bishop's court to the king in chancery. But the most important act passed this session, was that which regulated the succession to the crown: the marriage of the king with Catharine was declared unlawful, void, and of no effect: the primacy of the see annulling it was ratified; and the marriage with queen Anne was established and confirmed. The crown was appointed to descend to the issue of this marriage, and falling there, to the king's heirs for ever. An oath was likewise enjoined to be taken in favour of this order of succession, under the penalty of imprisonment during the king's pleasure, and forfeiture of goods and chattels: and all fander against the king, queen, or their issue, was subjected to the penalty of misprision of treason. These several acts, so contemptuous towards the pope, and so destructive of his authority, were passed at the very time that Clement pronounced his bolly sentence against the king. The king found his ecclesiastical subjects as compliant as the laity. The convocation ordered that the act against appeals to Rome, together with the king's appeal from the pope to a general council, should be affixed to all the doors of all the churches in the kingdom; and they voted that the bishop of Rome had, by the laws of God, no more jurisdiction in England than any other foreign bishop; and that the authority which he and his predecessors had there exercised, was only by usurpation, and by the suffrance of English princes. The bishops went so far in their complaisance, that they took out new confirmations from the crown, in which all their spiritual and episcopal authority was expressly affirmed to be derived ultimately from the civil magistrate, and to be entirely dependent on his good pleasure.
Henry, however, with the caprice peculiar to his character, continued to defend the doctrines of the Romish church as fiercely as he attacked their jurisdiction. He alternately persecuted the Protestants for rejecting the former, and the Catholics for acknowledging the latter.

Nothing more forwarded the first progress of the reformers, than the offer which they made, of submitting all religious doctrines to private judgment, and the pamphlets given every one to examine the principles formerly imposed upon them. And what can be more just and reasonable? and yet the multitude, says Mr. Hume, were totally unqualified for this undertaking, though they were highly pleased with it. They fancied that they were exercising their judgment, while they opposed to the prejudices of ancient authority more powerful prejudices of another kind. The novelty itself of the doctrines; the pleasure of an imaginary triumph in dispute; the fervent zeal of the reformed preachers; their patience, and even acacity, in suffering persecution, death, and torments; a disgust at the restraints of the old religion; an indignation against the tyranny and interested spirit of the ecclesiastics:—these motives, says the same historian, whilst, as some may imagine, he is depreciating the principles of the reformation, were prevalent with the people; and by such considerations were men so generally induced, during that age, to throw off the religion of their ancestors. In proportion, says the same author, as the practice of submitting religion to private judgment was acceptable to the people, it appeared, in some respects, dangerous to the rights of sovereigns, and seemed to destroy that implicit obedience on which the authority of the civil magistrate is chiefly founded. When some Englishmen, such were Tindal, Joyce, Conulantine, and others, retired to Antwerp, through fear of the exertion of the king's authority, they employed themselves in writing English books against the corruptions of the church of Rome; against images, relics, and pilgrims; and they excited the curiosity of men with regard to that question, which is the most important in theology, the terms of acceptance with the Supreme Being. These books, having been secretly conveyed to England, began to make converts everywhere; but it was a translation of the scriptures by Tindal that was esteemed the most dangerous to the established faith. Against Wolly, a favourite minister of Henry VIII., it was one article of impeachment, that, by his connivance, he had encouraged the growth of heresy, and that he had protected and acquitted some notorious offenders. Wolly was succeeded in the office of chancellor by Sir Thomas More, who, irritated by polemics, became so superstitiously attached to the ancient faith, that few inquisitors have been guilty of greater violence in their prosecution of heresy. Several persons were not only brought into the courts for heretical offences, such as teaching their children the Lord's prayer in English, for reading the New Testament in that language, or for speaking against pilgrimages; and others were charged with the capital offences of harbouring persecuted preachers, neglecting the faits of the church, and declaring against the vices of the clergy. Some were tried, condemned, and committed to the flames. Notwithstanding the inconstant conduct of Henry, his subjects having been encouraged, by his example, to break fome of their fetters, were so impatient to shake off all that remained, that in the following reign, under his son Edward VI., with the general applause of the nation, a total separation was made from the church of Rome in articles of doctrine, as well as in matters of discipline and jurisdiction. (See Articles.) In 1553, his death retarded the progress of the reformation; and his fifty Mary, who succeeded him, imposed a new arbitrary laws and tyrannical yoke of Rome upon the people of England. But the execution of a great number of persons, who were burnt for the Protestant faith in the five years of her persecuting and bloody reign, so alienated the people from Popery, that Queen Elizabeth, her sister, found it no hard matter to deliver her subjects from the bondage of Rome, and to establish that form of religious doctrine and ecclesiastical government, which had subsisted in England.

The seeds of the reformation were very early sown in Scotland, by several noblemen of that nation, who had retired in Germany during the religious disputes that divided the empire. The first and most eminent opposer of the Papal jurisdiction was John Knox, a disciple of Calvin, who set out from Geneva for Scotland in 1559, and in a little while prevailed with the greatest part of the Scotch nation entirely to abandon the superfluities of Rome, and to aim at nothing less than the total extirpation of Popery. In the following year, viz. 1560, the parliament ratified a confession of faith, agreeable to the new doctrines, and passing a statute against the mass, not only abolished it in all the churches, but enacted, that whoever, any where, either officiated in it, or was present at it, should be cast out, for the first offence, with confiscation of goods, and corporal punishment, at the discretion of the magistrate; for the second, with banishment; and for the third, with loss of life. A law was also voted for abolishing the Papal jurisdiction in Scotland; the Presbyterian form of discipline was settled, leaving only at first some shadow of authority to certain ecclesiastics, whom they called superintendants. From that period to the present times the form of doctrine, worship, and discipline, that had been established at Geneva by the ministry of Calvin, has been maintained in Scotland with invincible obstinacy and zeal; and every attempt to introduce, into that kingdom, the rites and government of the church of England, has proved impotent and unsuccessfull. See Presbyterians.

The cause of the reformation in Ireland underwent the same vicissitudes that had attended it in England. When Henry VIII., after the abolition of the Papal authority, was declared supreme head of the church of England, George Brown, a native of England, and a monk of the Augustinian order, whom that monarch had created, in the year 1535, archbishop of Dublin, began to act with the utmost vigour, in conformance of this change in the hierarchy. He purged the churches of his diocese from superfluity in all its forms, pulled down images, destroyed relics, abolished absurd and idolatrous rites, and, by the influence as well as authority he had in Ireland, caused the king's supremacy to be acknowledged in that nation. Henry heard soon after, that this supremacy was not a vain title; for he banished the monks out of that kingdom, confiscated their revenues, and destroyed their convents. In the reign of Edward VI., farther progress was made in the reformation, but the accession of Mary retarded it, in conformance of which Brown and other Protestant bishops were deprived of their dignities in the church. When Elizabeth ascended the throne, the Irish were again obliged to submit to the form of worship and discipline established in England.

The reformation had not been long established in Britain, when the Belgic provinces, united by a respectable confederacy which still subsisted, withdrew from their spiritual allegiance to the Roman pontiff. The means which Philip II., king of Spain used to obstruct the reformation, promoted it: the nobility formed themselves into an association, in the year 1566, and roused the people; who, under the heroic conduct of William of Nassau, prince of Orange, seconded by the succours of England and France, delivered this state from
from the Spanish yoke; and consequence of which the reformed religion, as it was professed in Switzerland, was established in the United Provinces; and, at the same time, an universal toleration granted to all those religious ten- 

tments were of a different nature, whether they retained the 
faction of Rome, or embraced the reformation in another form, 

in, provided that they made no attempts against the authority 
of the government, or the tranquillity of the public.

Whilst Mr. Hume attributes the quick and surprising 

growth of the reformation in part to the late invention of 

printing, and revival of learning, he denies that reason had 

any considerable share in opening men's eyes with regard to 

the impurities of the Roman church; alleging that philo- 

sophy had made little progress, at least not this long after 

the period of the reformation, and that no instance occurs in 

which argument has ever been able to free the people from 

such enormous bias of prejudice with which superstition has 

every where overwhelmed them: to which he adds, that the 

rapid advance of the Lutheran doctrine, and the violence 

with which it was embraced, prove sufficiently that it owed 

not its force to reason and reflection. The art of printing, 

and the revival of learning, it continued its progress in 

another manner. Examples of tis art, the books of Luther 

and his followers, full of vehement declaration, and a rude 

disquisition, were propagated more quickly, and in great 

numbers. The minds of men, somewhat awakened from the profound slum of so many centuries, were prepared 

for every novelty, and furnished hands to carry in any manifold 

path which was opened to them. And as copies of the 

hieroglyphics, and other ancient monuments of the Christian 

ranks, became more common, men perceived the innovations 

which were introduced after the first century; and though 

argument and reasoning could not give conviction, an histori- 

cal fact, well supported, was able to make impression on 

their minds. In the reformation, the pope, the councils, 

which would not agree to punish their privileges, though ancient; and to almost every political establishment in Europe, that matters 

of civil right, which must might render valid, but appeared 

in a divine right, they thus tempted men to look to their 

principal charter, which, with little difficulty, they could 

perceive to be in truth and authenticity. Besides, 

Luther and his followers, not satisfied with opposing the 

prerogative of the Roman church, and defending the 

temporal inconveniences of that establishment, proceeded to 

trick the religion of their ancestors, the duodecems, 

and damnum; forebode by fear, wept itself, as the source 

of all wickedness and pollution. They demonstrated the 

pope antichrist, called his consecration the scarlet whore, 

and gave to Rome the appellation of Babylon; expulsions 

which, however applied, were to be found in Scripture, 

and which were better calculated to operate on the multitude 

than the most世俗 arguments. Exalted by contest and 

permanence on the one hand, by success and applause on the 

other, many of the reformers carried to the greatest 

extremities their opposition to the church of Rome; and in 

contradiction to the multiplied superstitions with which 

that communion was loaded, they adopted an enthusiastic form of 

dissent, which admitted of no obtrusions, rites, or 

ceremonies, but placed all merit in a sylph-like species of 

faith, in inward vision, rapture, and ecstasy. The new 

tenets, joined with this spirit, were intolerable in the 

propagation of their doctrine, and set at defiance all the 

anathemas and punishments with which the Roman pontiff 

endeavored to overawe them.

Thus, in terms which appear to us too disparaging, does 

our historian describe the origin and progress of the reformation; but does he pay due respect to the principles on which
with such vehemence, that the most vigilant attention of the civil magistrate, the highest claims of pontifical authority, and all the rigour of the inquisitorial jurisdiction, were requisite to check or extinguish it. The defection of so many opulent and powerful kingdoms from the papal see was a fatal blow to its grandeur and power, and produced a very considerable diminution of its revenues. It likewise obliged the Roman pontiffs to adopt a different system of conduct towards the nations which continued to recognize their jurisdiction, and to govern them by new maxims, and with a milder spirit. They became afraid of venturing upon any such exertion of their authority as might alarm or exasperate their subjects, and excite them to a new revolt. Hence it happens, that the popes, from the era of the reformation, have ruled rather by address and management than by authority. They have been obliged not only to accommodate themselves to the notions of their adherents, but to pay some regard to the prejudices of their enemies. In process of time, and before the convulsions which have lately agitated Europe, they sunk almost to a level with the other prince of Italy; and they hardly retain any shadow of the temporal power which they anciently possessed. Nevertheless, whilst the reformation has been fatal to the power of the popes, it has contributed to improve the church of Rome both in science and in morals. Many motives have arisen out of the reformation, and the existence of two rival churches, which have served to engage the Catholic clergy to apply themselves to the study of useful science, and to pay a diligent attention to the manners of their clergy. In those countries where the members of the two churches have mingled freely with each other, or have carried on any considerable intercourse, either commercial or literary, an extraordinary alteration in the ideas, as well as in the morals, of the Popish ecclesiastics is manifest. The beneficial influence of the reformation has not only been felt by the clergy, and the inferior members of the Roman Catholic church; but it has extended to the see of Rome, and to the sovereign pontiffs themselves, whose character, at a later period, has been very different from that of several of their predecessors. Many of them have been conspicuous for the virtues becoming their high station; and by their humanity, their love of literature, and their moderation, have made some atonement to mankind for the crimes of those who in former times occupied their places. Thus the reformation has eminently contributed to increase purity of manners, to diffuse science, and to inspire humanity. With the progress of the reformation we may also connect a variety of other important benefits, both to individuals and to society; and as they pertain to the improvement of science, to the promotion of liberty both civil and religious, to the diffusion of knowledge and virtue, and to the advancement of the best interests of mankind. But the details of the advantages resulting from the reformation to nations and private persons, to religion in general, and genuine Christianity in particular, would far exceed the limits to which we are confined.

See, on the subject of this article, Robertson's Hist. of Charles V. vol. ii. p. 113, &c. vol. iii. p. 44, &c. Moheim's Eccl. Hist. Eng. ed. 8vo. vol. iii. Burnet's Hist. of the Reformation, passim. For a comprehensive, and, upon the whole, a just sketch of the predisposing causes, and beneficial consequences of the reformation, we refer the reader to a work which obtained the prize proposed by the National Institute of France, 15th of Germinal, in the year X. viz. "What has been the influence of the reformation by Luther on the political situation of the different states of Europe, and on the progress of knowledge?"

The work is entitled "An Essay on the Spirit and Influence of the Reformation by Luther," by C. Villars. We have two English translations, one by B. Lambert, and the other by James Mill, 8vo. 1825.

Reformation, Right of. See Reformatio.

Refracted Angle, in Optics, the angle contained between the refracted ray and the perpendicular.

Refracted Diaf, are such as shew the hour by means of some refracting transparent fluid. See Di&;s, Refracted Ray, or ray of refraction. See Ray and Refraction.

Refracted Vision. See Vision.

Refracting Telescope. See Telescope.

Refraction, Refraction, in Mechanics, the deviation of a moving body from its direct course, by reason of the different density of the medium it moves in; or a species of change and determination, occasioned by a body's falling obliquely out of one medium into another of a different density.

Thus a ball A (Plate XXXVI. Mechanics, fig. 14.) moving in the air in the line AB, and falling obliquely on the surface of the water CD, does not proceed straight to E, but deviates, or is refracted, to F. Again, if the ball, moving in water in the same line AB, should fall obliquely on a surface of air CD, it will not proceed straight to E, nor yet deflect to F, but to G. Now the deviation in each case is called the refraction: and the two cases are distinguished by means of the perpendicular M I; that is being called refraction towards the perpendicular, or to the axis of refraction; and the other BE, refraction from the perpendicular, or from the axis of refraction.

These refractions are supposed to arise hence, that the ball arriving at B, in the first case, finds no refraction or opposition on the one side O, i.e. from the side of the water, than it did from the side P, or that of the air; and in the latter more resistance from the side P, which is now the side of the water, than the side O, which is that of the air.

The great law of refraction, then, which holds in all bodies, and all mediums, is that a body, falling obliquely out of a medium which resists it more, is refracted towards the perpendicular; and in passing out of a medium which opposes it less into another which opposes it more, it is refracted from the perpendicular.

Hence the rays of light falling obliquely, or from water into air, are refracted towards the perpendicular; whereas a ball thrown into water is refracted from it, because water, which resists the motion of light less than air, resists that of the ball more; or, to speak more truly, because water, by its greater attraction, accelerates the motion of the rays of light more than air does; for that this is the true cause of refraction, at least in light, shall be shewn under Refraction of light.

To have a body refracted, it is necessary that it should fall obliquely on the second medium. In perpendicular incidence there is no refraction.
Vossius indeed, and Snellius, imagined they had observed a perpendicular ray of light undergo a refraction; a perpendicular object appearing in the water nearer than in reality it was; but this was to attribute that to a refraction of the perpendicular rays, which was owing to the divergence of the oblique rays after refraction, from a nearer point.

Yet there is a manifest refraction even of perpendicular rays found in \textit{Iceland Crystal}, which fees.

Rohault adds, that though an oblique incidence be necessary in all other mediums we know of, yet the oblique must not exceed a certain degree; if it do, the body will not penetrate the medium, but will be reflected instead of being refracted.

Thus cannon-balls, in sea-engagements, falling very obliquely on the surface of the water, are observed to mount aloft again, and frequently to sweep the men off from the opposite decks; and the like happens to the little stones with which children make their ducks and drakes.

The ancients confounded refraction with reflection, and it was for Isaac Newton who first taught us the just difference between them. He shews likewise, that there is a good deal of analogy between them, and particularly in the case of light.

The laws of refraction of the rays of light in mediums differently terminated, \textit{i.e.} whose surfaces are plain, concave, convex, &c. make the subject of \textit{dioptrics} which fees.

By refraction it is, that convex glasses, or lenses, collect the rays, magnify objects, burn, &c. and hence the foundation of microscopes, telescopes, &c.

By refraction it is, that all remote objects are seen out of their real places; particularly, that the heavenly bodies are apparently higher than they are in reality, &c.

The refraction of the air has many times so uncertain an influence on the places of celestial objects, very remote from the zenith, that wherever refraction is concerned, the conclusions deduced from observations that are much affected by it, will always remain doubtful, and too precarious in many cases to be relied upon. See Dr. Bradley, in Phil. Trans. No. 485.

See \textit{Atmospherical Refraction}.

\textbf{Refraction of Light, in Optics,} is an inflection or deviation of the rays from their rectilinear course upon falling obliquely out of one medium into another, of a different density.

The term refraction is derived from the distorsion which it occasion in the appearance of an object viewed in part only by refracted light; thus, an oak, partially immersed in water, appears to be bent, on account of the refraction of the light, by which its lower part is seen, in its passage out of the water into the air.

Although no sensible light can penetrate more than 700 feet deep into the sea, and a length of leven feet of water has been found to intercept one-half of the light which enters into it; yet in transparent substances (no medium being, strictly speaking, absolutely transparent,) the greater part of the light penetrates to all depths with little interruption, and all rays of the same kind, thus transmitted by the same surface, form with the perpendicular an angle of refraction, which is ultimately in a certain constant proportion to the angle of incidence; that is, for instance, one-half, three-fourths, or two-thirds, according to the nature of the surface.

Thus, if the refractive properties of the substance were such, that an incident ray, making an angle of one degree with the perpendicular, would be so refracted as to make an angle of only half a degree with the same line, another ray, incident at an angle of two degrees, would be refracted, without sensible error, into an angle of one degree. But when the angles are larger, they vary from this ratio, their lines only preferring the proportion with accuracy; for example, if the angle of incidence at the supposed surface were increased to 90°, the angle of refraction would be 35° only, instead of 45°.

It does not appear that, before Descartes, any person attempted to explain the physical cause of the refraction, and also the refraction of light, which he undertook to do by the revolution of forces, on the principles of mechanics: in consequence of which he was led to suppose that light passes with more ease through a dense medium than a rare one; thus the ray \textit{A B} (Plate XVIII. Optics, \textit{fig.} 10.) falling obliquely on another medium at \textit{B}, is supposed to be acted on by two forces, one of them compelling it in the direction \textit{A C}, and the other in \textit{A D}, which alone can be affected by the change of medium; and since, after the ray has entered the denser medium, it approaches the perpendicular \textit{B H}, it is plain that this force must have received an increase, whilst the other continued the same; for if \textit{B E} be taken equal to \textit{B D}, or \textit{C A}, the consequence of the angle \textit{E B H} being less than \textit{A B C} will be, that \textit{B H} must be longer than \textit{B C} or \textit{A D}.

The first person who questioned the truth of this explanation of the cause of refraction was M. Fermat, who asserted, contrary to Descartes, that light suffers greater resistance in water than in air, and greater in glass than in water; and he maintained that the resistance of different mediums, with respect to light, is in proportion to their densities. M. Leibnitz adopted the same general idea; and they reasoned upon the subject in the following manner. Nature, they say, accomplishes her ends by the shortet methods; light, therefore, ought to pass from one point to another, by either the shortet road, or that in which the least time is required. But it is plain that the line in which light passes, when it falls obliquely upon a denser medium, is not the most direct or the shortest; so that it must be that in which the least time is spent. And, whereas it is demonstrable, that light falling obliquely upon a denser medium (in order to take up the least time possible, in passing from a point in one medium to a point in the other) must be refracted in such a manner, that the lines of the angles of incidence and refraction must be to one another, as the different facilities with which light is transmitted in those mediums; it follows that, since light approaches the perpendicular when it passes obliquely from air into water (so that the line of the angle of refraction is less than that of the angle of incidence), the facility with which water suffers light to pass through it is less than that of the air; so that the light meets with greater resistance in water than in air. This method of arguing from final causes could not satisfy philosophers. Dr. Smith observes that it agrees only to the case of refraction at a plain surface; and that the hypothesis is altogether arbitrary. If he had endeavoured to accommodate his principle to concave and convex surfaces, as he had once propo'd, he would soon have perceived its insufficiency. The easiest way for a ray to pass from a given point in any refiting medium into a vacuum, is in a perpendicular to the refracting surface, this being the shortest way, through any difficulty or resistance whatever; but this being reduced to nothing at the refracting surface, it may then take any other course in vacuo, without any further difficulty; and, on the contrary, in returning back from the vacuum into the dense medium, it must take the shortest course through the same perpendicular as before.

Thus, when the sun shines upon the atmosphere, all his rays should be refracted into lines tending to the centre of the earth, as being the shortest and caifiers way through the atmosphere, and then we should see the sun exactly over our heads, in all places and at all times. Such is the strange
consequence that follows from an hypothesis so arbitrary.

Descartes, in order to explain the law of refraction, supposes that every ray of light is composed of several smaller rays, which adhere to one another; and that they are refracted towards the perpendicular, in passing into a denser medium, because one part of the ray meets with more refilience than another part: so that the former traverses a smaller space than the latter; in consequence of which the ray must necessarily bend a little towards the perpendicular. This hypothesis was adopted by the famous Dr. Barrow, who, as some say, was the author of it. On this hypothesis, it is plain that mediums of a greater refractive power must give greater refilience to the passage of the rays of light than mediums of a less refractive power, which is contrary to fact.

The Bernouillus, both father and son, have attempted to explain the cause of refraction on mechanical principles; the former on the equilibrium of forces, and the latter on the same principles with the supposition of ethereal vortices; but neither of these hypotheses have gained much credit. M. Mairan supposes a subtle fluid, filling the pores of all bodies, and extending, like an atmosphere, to a small distance beyond their surfaces; and then he supposes that the refraction of light is nothing more than a necessary and mechanical effect of the incidence of a small body in those circumstances. There is more, he says, of the refracting fluid in water than in air, less in water than in glass, and in general less in a denser medium than in one that is rarer. M. de Maupertuis supposes that the course which every ray takes, in passing from one medium into another, is that which requires the least quantity of action, which depends upon the velocity of the body, and the space it passes over; so that it is in proportion to the sum of the spaces, multiplied by the velocity with which bodies pass over them. From this principle he deduces the necessity of the sine of the angle of incidence being in a constant proportion to that of refraction: and also all the other laws relating to the propagation and reflection of light.

Dr. Smith (in his Optics, Remarks, p. 70.) observes, that all other theories for explaining the reflection and refraction of light, except Sir Isaac Newton's, supposes that it strikes upon bodies, and is reflected by them, which has never been proved by any deduction from experience. On the contrary, it appears by various considerations, and might be shewn by Mr. Molyneux's and professor Bradley's observations on the parallax of the fixed stars, that their rays are not at all impelled by the rapid motion of the earth's atmosphere, nor by the object-glasses of the telescope through which they pass. And by Sir Isaac Newton's theory of refraction, which is grounded on experience only, it appears, that light is so far from being reflected and retarded by reflection into any denser medium, that it is twiftered there than in vacuo, in the ratio of the sine of incidence in vacuo to the sine of refraction into the denser medium. From these considerations, we are led to suppose, says Dr. Young (Left. Phil. vol. i. p. 460.) that the velocity of light must be smaller in a denser than in a rarer medium; and supposing this fact to be established, the existence of such an attractive force as for Sir Isaac Newton supposes could no longer be allowed; nor, he says, could the system of the emanation of light, in opposition to that of the undulation of an ethereal medium, be maintained by any one. Priestley's Hist. of Light, &c. p. 102, &c. p. 333, &c.

The refraction of light, Sir Isaac Newton shews, is not performed by the very rays falling on the surface of bodies; but it is done without any contact, by the action of some power belonging to bodies, and extending to a certain dis-tance without their surfaces; by which same power, acting in other circumstances, they are also emitted and reflected.

Admitting that certain powers of attraction and repulsion belong to bodies, and extend to a certain distance beyond their surfaces; and supposing also that light consists of particles emitted from luminous bodies, sir Issac Newton demonstrates, in his "Principia," that the sine of the angle of incidence must always be to the sine of the angle of refraction in some certain ratio. For, as he proves geometrically, if two similar mediums be separated from each other by a space terminated on both sides by parallel planes, and a body, in its passage through that space, be attracted or impelled perpendicularly towards either of those mediums, and not agitated or hindered by any other force; and if the attraction be every where the same, at equal distances from either plane, taken towards the same hand of the plane, the sine of incidence upon either plane will be to the sine of emergence from the other plane in a given ratio.

In a corollary to this proposition he also shews, that if, instead of one parallel space, bodies be surrounded with several, or an infinite number of them, the attractive power of each of which differs from the next, increasing or decreasing, still, the ratio respecting any two contiguous ones being given, the ratio of the extremes will be given. He also demonstrates, that, if the cause of refraction be the attraction of the refracting medium, the velocity of light before its incidence will be to its velocity afterwards, as the sine of the angle of refraction is to the sine of the angle of incidence; so that light, in pasling from a rarer medium into a denser, receives an increase of velocity. The same things being supposed, he shews, that if the velocity before incidence be greater than afterwards, so that the angle of emergence must always increase, in consequence of the repulsive power prevailing over the attractive one, the body will at length be reflected; and that, in this case, the angle of refraction must necessarily be equal to the angle of incidence.

That light does not consist of any mode of action upon a fluid medium, he concludes from having demonstrated that pressure cannot be propagated through a fluid in rectilinear directions, unless where the particles of the fluid lie in a right line, but must diverge into the unmoved spaces; and that every tremulous body, in an elastic medium, propagates the motion of the pulses on every side straight forwards. Admitting this, there is hardly any hypothesis that will agree with the phenomena of light, but that of particles emitted from the luminous body, affected by the attractions and repulsions of other bodies.

The same arguments by which we have proved, that reflection (which fee) is performed without immediate contact, will go a great way towards demonstrating the fame of refraction: to which may be added the following ones.

1. Because, if when light falls out of glass into air with the utmost obliquity it will be transmitted at, it be then made to fall a little more obliquely, it becomes wholly reflected, for the power of the glass, after it has refracted light emerging as obliquely as possible, supposing the rays to fall still more obliquely, will be too strong to let any of the rays pass; conseqentially, instead of being refracted, they will all be reflected.

2. Because in thin lamelle, or plates of glass, light is reflected and transmitted several times alternately, as the thicknes of the lamelle increases in arithmetical progression; for here it depends on the thicknes of the lamina which of the two the glass shall do, whether reflect it, or let it be transmitted.

3. Because, whereas the power of other bodies both to reflect and refract light are very nearly proportional to their densties;
Refractive forces; yet unctuous and sulphureous bodies are found to\nreflect more strongly than according to their mere densities; for as the rays act more strongly on these bodies to\nkindle them than on others, so do they again, by their mutual\nattraction, act more strongly on the rays to reflect them.

Lastly; Because not only those rays transmitted through\nglass are found to be refracted, but also those passing in the\nair, or in a vacuum near its extremities, or even near the\nextremes of many opaque bodies, e. gr. the edge of a knife,\nundergo a similar refraction, from the attraction of the body. See \nLight; and also Infection.

The manner in which refraction is performed by mere\nattraction, without contact, may be thus accounted for: sup-
pose H I (Plate XVIII. Optics, fig. 11.) the boundary of two\nmedia, N and O; the first the rarer, e. gr. air; the\nsecond the denser, e. gr. glass; the attractions of the\nmediums here will be as their densities. Suppose \nPS to be the\ndistance to which the attracting force of the denser medium\nexists itself within the rarer. Let now a ray of light A a\nfall obliquely on the surface which separates the media,\nor rather on the surface PS, where the action of the second\nand more refitting medium commences. All attraction being\nperformed in lines perpendicular to the attractive body, as\nthe ray arrives at a, it will begin to be turned out of its\nrectilinear course by a superior force, with which it is attracted\nby the medium O, more than by the medium N, i.e. by\na force with which it is driven towards it in a direction perpendicular\nto its surface: hence the ray is bent out of its\nright line in every point of its passage between PS and RT,\nwithin which distance the attraction acts. Between those\nlines, therefore, it describes a curve ABb; but beyond RT,\nbeing out of the sphere of attraction of the medium N, it\nwill proceed uniformly in a right line, according to the di-
rection of the curve in the point b.

Again, suppose N the denser and more refitting medium,\no the rarer, and HI the boundary, as before; and let \nRT be the distance to which the denser medium exerts its\nattractive force within the rarer: even when the ray has palled\nthe point B, it will be within the sphere of superior attraction\nof the denser medium; but that attraction acting in lines\nperpendicular to its surface, the ray will be continually\ndrawn from its straight course BM perpendicularly towards\nHI: thus, having two forces or directions, it will have\na compound motion, by which, instead of BM, it will de-
scribe BM, which in its line of rimness is a curve.

Lastly, after it has arrived in m, being out of the\ninfluence of the medium N, it will perfit uniformly in a right\nline, in the direction in which the extreme of the curve\nleaves it.

Thus we see how refraction is performed, both towards\nthe perpendicular, and from it.

But note, the attraction of the denser medium, e. gr. N,\nis continually diminishing, as the ray proceeds from B, to-
wards the limit of attraction RT; because fewer and fewer\nparts still come to act at HI, e. gr. all the parts between\nthat and PS attract; but at RT, none but those in the line\nHI. Note also, that the distance between PS and RT\nbeing small, when we consider refractions, no notice is taken\nof the curve part of the ray, but we consider it as consisting\nof two straight lines, CB, or AB, or m B, A B.

Sir Isaac Newton, not content with ascribing the reflec-
tion, refraction, and inflection of light to powers of attrac-
tion and repulsion, extending beyond the surfaces of bodies\nand producing effect in the manner above explained, propo-
ses a conjecture concerning the phyletic cause of this attrac-
tion and repulsion; but his hypothesis is no less liable to\ndifficulties and objections than the hypothesis of the me-
chanical production of the motion of light without attrac-
tion or repulsion. Does not the refraction of light, he says,
arise from the different density of an ethereal medium in\ndifferent places, the light always receding from the denfer\nparts of the medium? And is not the density of it greater\nin free and open spaces void of air, and other grofs bodies,\nthan within the pores of water, glass, crystal, gems, and\nother compact bodies? For when light passes through glass\nor crystal, and falling very obliquely upon the farther su-
face, is all reflected, the total refraction ought to arise rather\nfrom the density and vigour of the medium without and be-
\nground; than from the rarity and weaknesses of it.

Does not the ethereal medium, in passing out of water, glass,\ncrystal, and other compact and dense bodies, into empty\nspaces, grow denser and denser by degrees, and by that\nmeans reflect the rays of light, not in a point, but by bend-
ing them gradually in curve lines? And does not the\ngradual condensation of this medium extend to some dis-
tance from the bodies, and thereby cause the inflections of\nthe rays of light, which pass by the edges of the dense\nbodies, at some distance from the bodies?

Refration, in Dioptrics, is the inflection or bending of\nthe rays of light, in passing the surfaces of glasses, lenses,\nand other transparent bodies of different densities.

Thus a ray, as AB (Plate XVIII. Optics, fig. 11.) falling\nobliquely from the radiant A, upon a point B, in a dia-
phantous surface, HI, rarer or denser than the medium\nalong which it was propagated from the radiant; has its\ndirection there altered by the action of the new medium;\nand instead of proceeding to M, it deviates, e. gr. to C.

This deviation is called the refraction of the ray; BC the\nrefracted ray, or line of refraction; and B the point of\nrefraction.

The line A B is called the line of incidence, or ray of in-
cidence; and, in respect of it, B is also called the point of\nicidence.

The plane in which both the incident and refracted rays\nare found, is called the plane of refraction; a right line BE,\ndrawn in the refracting medium perpendicular to the refra-
flecting surface, in the point of refraction B, is called the axis of\nrefraction; and a right line DB, drawn perpendicular to the\nrefracting surface, in the point of incidence B, along the\nmedium through which the ray fell, is called the axis of\nicidence.

The angle A BI, included between the incident ray and\nthe refracting surface, is called the angle of incidence; and\nthe angle ABD, included between the incident ray and the\naxis of incidence, is called the angle of inclination. The\angle M BC, which the refracted ray makes with the inci-
dent, is called the angle of refraction; and the angle CBE,\nwhich the refracted ray makes with the axis of refraction, is\ncalled the refracted angle.

Refration, general laws of. 1. A ray of light in its\npassage out of a rarer into a denser medium, e. gr. out of air\nto glass, is refracted towards the perpendicular, i.e. towards\nthe axis of refraction.

Hence, the refracted angle is less than the angle of incl-
ination; and the angle of refraction less than that of inci-
dence; as they would be equal were the ray to proceed\nstraight from A to M. Hence, also, a ray perpendicular\nto the refracting surface, will pass through without being\nrefracted, as it cannot be refracted to the perpendicular.

The physical cause of which is, that the attraction of the\ndenser medium, which, in an incidence oblique to its sur-
face acts perpendicularly to that surface, draws the ray\nout of its course; this attraction, we say, in a perpendi-
cular incidence, acts in the direction of the ray.

2. The ratio of the sine of the angle of inclination, to the sine of the angle of refraction, is equal to the ratio of the sine of the angle of incidence, to the sine of the angle of refraction.
Refraction.

The refraction angle, being fixed, and constant; viz. if the refraction be out of air into glass, it is found greater than as 114 to 76, but less than 115 to 76; that is, nearly as 3 to 2.

This ratio, assigned by Huygens, agrees with another of Sir Isaac Newton, who makes the angle of inclination to the angle of the refracted one, as 31 to 20; which is, likewise, nearly as 3 to 2. Indeed, there is some difference in the quantity of refraction, in different kinds of glass; but in physical matters, precipitation is not necessary. In rain-water, Descartes found the ratio of the angle of inclination, to the angle of the refracted one, as 250 to 187, that is nearly as 4 to 3; which agrees with Sir Isaac Newton's observation, who makes it as 529 to 396.

In spirit of wine, the same great author makes the ratio as 100 to 73; which is not far from the sequequitarian ratio. In air, he makes it as 3201 to 3200; and as to air, he shews, that a ray of light, in traversing quite through the atmosphere, is refracted the same as it would be, were it to pass with the same obliquity out of a vacuum into air of equal density with that in the lowest part of the atmosphere.

See the following table, in which the proportion of the refractions of several bodies; the densities of the bodies, estimated by their specific gravity; and their refractive power, in respect of their densities, are set down in separate columns.

<table>
<thead>
<tr>
<th>The refracting bodies.</th>
<th>The proportion of the fines of incidence and refraction of yellow light.</th>
<th>The refractive power of the body.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A pseudo-topaz, being a natural, pellucid, brittle, hairy stone, of a yellow colour</td>
<td>23 to 14.427 3979</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>3201 to 3200 0.0012 5208</td>
<td></td>
</tr>
<tr>
<td>Glafs of antimony</td>
<td>17 to 9 528 4864</td>
<td></td>
</tr>
<tr>
<td>A felenites</td>
<td>61 to 412 252 5386</td>
<td></td>
</tr>
<tr>
<td>Glafs vulgar</td>
<td>31 to 20 258 5430</td>
<td></td>
</tr>
<tr>
<td>Crystal of the rock</td>
<td>25 to 162 65 5450</td>
<td></td>
</tr>
<tr>
<td>Island crystal</td>
<td>5 to 3 72 6530</td>
<td></td>
</tr>
<tr>
<td>Salt gemma</td>
<td>17 to 11 143 6477</td>
<td></td>
</tr>
<tr>
<td>Alum</td>
<td>35 to 24 174 6570</td>
<td></td>
</tr>
<tr>
<td>Borax</td>
<td>22 to 15 174 6716</td>
<td></td>
</tr>
<tr>
<td>Nitre</td>
<td>32 to 21 1 9 7079</td>
<td></td>
</tr>
<tr>
<td>Dantzick vitriol</td>
<td>303 to 200 1 7551</td>
<td></td>
</tr>
<tr>
<td>Oil of vitriol</td>
<td>10 to 7 1 7 6124</td>
<td></td>
</tr>
<tr>
<td>Rain-water</td>
<td>529 to 396 1 7845</td>
<td></td>
</tr>
<tr>
<td>Gun arabic</td>
<td>31 to 21 1 375 8747</td>
<td></td>
</tr>
<tr>
<td>Spirit of wine well rectified</td>
<td>100 to 73 0 866 10121</td>
<td></td>
</tr>
<tr>
<td>Camphor</td>
<td>3 to 2 0 96 12551</td>
<td></td>
</tr>
<tr>
<td>Olive oil</td>
<td>22 to 10 0 91 12067</td>
<td></td>
</tr>
<tr>
<td>Linseed oil</td>
<td>40 to 27 0 932 12819</td>
<td></td>
</tr>
<tr>
<td>Spirit of turpentine</td>
<td>25 to 17 0 874 13222</td>
<td></td>
</tr>
<tr>
<td>Amber</td>
<td>14 to 9 1 04 13654</td>
<td></td>
</tr>
<tr>
<td>A diamond</td>
<td>100 to 41 3 4 14556</td>
<td></td>
</tr>
</tbody>
</table>

Newton's Optics, edit. 3. p. 247.

M. Euler the younger, pursuing a scheme suggested by his father for ascertaining the refractive powers of transparent liquors, made use of two Menisces glases, which they put together when they were plunged in the fluid, the refractive power of which he wanted to determine: the edges of these glases being ground flat, they immediately cohered, so that none of the fluid could escape; and then they might both together be wiped, and used as one object-
glas in a long tube, which he could lengthen or shorten at pleasure; and applying an eye-glas to it, the whole observation he had to make was to measure the exact length of his tube, when he could see through it most distinctly a turret, which was at a considerable distance from him. Or, when the focal distance was less than a foot, he only observed, at what distance from a wall the image of an oppo-
site window was the most distinct. Ac. Berlin. 1762, p. 302.

The refractive power of the fluids which he examined in this manner, he expressed in the following tables.

<table>
<thead>
<tr>
<th>The fine of the angle of incidence will be to that of refraction as</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ray of light passing from air into</td>
</tr>
<tr>
<td>Distilled water - - -</td>
</tr>
<tr>
<td>Rain-water - - -</td>
</tr>
<tr>
<td>Well-water - - -</td>
</tr>
<tr>
<td>French wine - - -</td>
</tr>
<tr>
<td>French brandy - - -</td>
</tr>
<tr>
<td>Ditto a stronger kind - - -</td>
</tr>
<tr>
<td>Rectified spirit of wine - - -</td>
</tr>
<tr>
<td>Ditto more highly rectified - - -</td>
</tr>
<tr>
<td>The white of an egg - - -</td>
</tr>
<tr>
<td>Distilled vinegar - - -</td>
</tr>
<tr>
<td>A solution of gum arabic - - -</td>
</tr>
<tr>
<td>A solution of two scruples of white sugar in an ounce of water - - -</td>
</tr>
<tr>
<td>A solution of two scruples of rock-falt, in ditto - - - - - -</td>
</tr>
<tr>
<td>A solution of two scruples of salt of urine in ditto - - - -</td>
</tr>
<tr>
<td>Oil of Provence - - -</td>
</tr>
<tr>
<td>Oil of turpentine - - -</td>
</tr>
</tbody>
</table>

N.B. The rock-falt and the salt of urine were purified by a double crystallization.

By a second pair of Menisces.

<table>
<thead>
<tr>
<th>The fine of the angle of incidence will be to that of refraction as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water - - -</td>
</tr>
<tr>
<td>Rain-water - - -</td>
</tr>
<tr>
<td>Well-water - - -</td>
</tr>
<tr>
<td>French wine - - -</td>
</tr>
<tr>
<td>French brandy - - -</td>
</tr>
<tr>
<td>Ditto a stronger kind - - -</td>
</tr>
<tr>
<td>Spirit of wine rectified - - -</td>
</tr>
<tr>
<td>Ditto more highly rectified - - -</td>
</tr>
<tr>
<td>Tea - - -</td>
</tr>
<tr>
<td>Mineral alkali saturated (I suppose with water) - - - - - -</td>
</tr>
<tr>
<td>Spirit of nitre - - -</td>
</tr>
<tr>
<td>A solution of two scruples of Glauber's salt in an ounce of water - - -</td>
</tr>
<tr>
<td>A solution of two scruples of digestive salt of Sylvis in ditto - - -</td>
</tr>
<tr>
<td>A solution of two scruples of sal ammoniac in ditto - - - -</td>
</tr>
<tr>
<td>A solution of two scruples of copperas in ditto - - - - - -</td>
</tr>
<tr>
<td>Oil of tartar per deliquium - - -</td>
</tr>
<tr>
<td>Oil of Provence - - -</td>
</tr>
<tr>
<td>Oil of turpentine - - -</td>
</tr>
</tbody>
</table>
The refractive power of some other fluids found by the second pair of Meniscules, 18th August, 1761, Reaumur's thermometer being 31 degrees above the freezing point.

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Refractive Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1.3351</td>
</tr>
<tr>
<td>Spirit of honey</td>
<td>1.3355</td>
</tr>
<tr>
<td>Spirit of sal ammoniac</td>
<td>1.3377</td>
</tr>
<tr>
<td>Oil of amber</td>
<td>1.3377</td>
</tr>
<tr>
<td>Spirit of hartthorn</td>
<td>1.3399</td>
</tr>
<tr>
<td>Human urine</td>
<td>1.3411</td>
</tr>
<tr>
<td>White of an egg</td>
<td>1.3511</td>
</tr>
<tr>
<td>Jelly of hartthorn</td>
<td>1.3541</td>
</tr>
<tr>
<td>French brandy</td>
<td>1.3721</td>
</tr>
<tr>
<td>Spirit of wine</td>
<td>1.3721</td>
</tr>
<tr>
<td>Distilled vinegar</td>
<td>1.3721</td>
</tr>
<tr>
<td>Gum ammoniac</td>
<td>1.3723</td>
</tr>
<tr>
<td>Aqua regia</td>
<td>1.3808</td>
</tr>
<tr>
<td>Dittro from aqua fortis and sal ammoniac</td>
<td>1.3964</td>
</tr>
<tr>
<td>Aqua fortis</td>
<td>1.4044</td>
</tr>
<tr>
<td>Spirit of nitre</td>
<td>1.4076</td>
</tr>
<tr>
<td>The crystalline humour of an ox's eye</td>
<td>1.4635</td>
</tr>
<tr>
<td>Butter of antimony</td>
<td>1.6831</td>
</tr>
<tr>
<td>Oil of vitriol</td>
<td>1.4262</td>
</tr>
<tr>
<td>Oil of wax</td>
<td>1.4524</td>
</tr>
<tr>
<td>Oil of lavender</td>
<td>1.4560</td>
</tr>
<tr>
<td>Oil of rofemary</td>
<td>1.4719</td>
</tr>
<tr>
<td>Oil of originum</td>
<td>1.4770</td>
</tr>
<tr>
<td>Oil of ginger</td>
<td>1.4799</td>
</tr>
<tr>
<td>Oil of oranges</td>
<td>1.4833</td>
</tr>
<tr>
<td>Oil of turpentine</td>
<td>1.4833</td>
</tr>
<tr>
<td>Oil of favine</td>
<td>1.4857</td>
</tr>
</tbody>
</table>

The refractive powers of some transparent liquors according to the observations of Sir Isaac Newton. See Optics, p. 247.

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Refractive Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ray of light passing from air into</td>
<td>1.3351</td>
</tr>
<tr>
<td>A yellow pseudo-topaz</td>
<td>1.6429</td>
</tr>
<tr>
<td>Air</td>
<td>0.5997</td>
</tr>
<tr>
<td>Glafs of antimony</td>
<td>1.4878</td>
</tr>
<tr>
<td>A felenites</td>
<td>1.4524</td>
</tr>
<tr>
<td>Cristal of the rock</td>
<td>1.5620</td>
</tr>
<tr>
<td>Island crystal</td>
<td>1.6666</td>
</tr>
<tr>
<td>Sal gem</td>
<td>1.5455</td>
</tr>
<tr>
<td>Alum</td>
<td>1.5477</td>
</tr>
<tr>
<td>Borax</td>
<td>1.5467</td>
</tr>
<tr>
<td>Nitre</td>
<td>1.5438</td>
</tr>
<tr>
<td>Dantzick vitriol</td>
<td>1.5000</td>
</tr>
<tr>
<td>Oil of vitriol</td>
<td>1.4285</td>
</tr>
<tr>
<td>Rain-water</td>
<td>1.3358</td>
</tr>
<tr>
<td>Gum arabie</td>
<td>1.4771</td>
</tr>
<tr>
<td>Spirit of wine well rectified</td>
<td>1.3698</td>
</tr>
<tr>
<td>Camphor</td>
<td>1.5600</td>
</tr>
<tr>
<td>Olive oil</td>
<td>1.4666</td>
</tr>
<tr>
<td>Linseed oil</td>
<td>1.4814</td>
</tr>
<tr>
<td>Spirit of turpentine</td>
<td>1.5625</td>
</tr>
<tr>
<td>Amber</td>
<td>1.5556</td>
</tr>
<tr>
<td>A diamond</td>
<td>2.4390</td>
</tr>
</tbody>
</table>

See Priestley's Hist. of Light, &c. p. 479. &c.

Whence the different refractive power in different fluids arises, is not determined. Sir Isaac Newton shows, that in many bodies, of glafs cristal, a felenites, pseudo-topaz, &c. the refractive power is proportionable to their denitities; only in sulphureous bodies, as camphor, linseed oil, olive, amber, spirit of turpentine &c. the power is two or three times greater than in other bodies of equal denity; yet even these have the refractive power with respect to each other nearly as their denitities.

Water has a refractive power in a middle degree between those two kinds of substantias, and is, probably, of a middle nature. Salts and vitirols have refractive powers in a middle degree between those of earthy substantias and water, and accordingly are compos'd of those two sorts of substantias. Spirit of wine has a refractive power in a middle degree between those of water and oily substantias; and accordingly seems to be compos'd of both, united by fermentation. It appears, therefore, that all bodies seem to have their refractive powers proportional to their denitities, or very nearly, excepting so far as they partake of more or less sulphureous oily particles, and thereby have their refractive powers made greater or less. Whence it seems reasonable to attribute the refractive power of all bodies...
bodies chiefly, if not wholly, to the sulphureous parts with which they abound.

From the observations of M. Euler it appears, that there is no fluid, and probably no transparent substinance of any kind, the refractive power of which is less than that of rain-water, or distilled water; and betwixt air and rain-water there is no substinance that has an intermediate refractive power.

After rain-water immediately follows well-water; but there are probably as many varieties in its refractive power as there are different wells. We may, however, conclude, that the ratio of refraction from air into well-water is contained between the limits of 1.3.16 to 1, and 1.3.37 to 1.

Spirituous liquors have a greater refractive power in proportion to their strength; but the ratio of refraction from air into any spirituous liquor is never less than 1.3.4; nor greater than 1.3.7.

There is, probably, no kind of salt, but what, being dissolved in water, increases its refractive power.

The solutions of salt of urine and of vitriol have the least refractive powers, and those of rock-salt and salt amnonic the greatest; but the ratio of refraction from air into any saline solution, preferring the proportion of one ounce of salt to twelve of water, will be contained between the limits of 1.3.4 to 1. and 1.3.5 to 1.

Distilled vinegar, and the solution of gum arabic, have nearly the same refractive power with common French wine; and the refractive power of white of egg is the same as that of rectified spirit of wine.

Mineral alkali saturated, seems to have the same refractive power with very strong brandy.

Spirit of nitre and oil of tartar per deliquium have a medium refractive power between spirituous liquors and oils.

The refractive powers of oils approach the nearest to that of glafs, especially oil of turpentine, which had the greatest refractive power of all the fluids on which he had made experiments.

Sir Isaac Newton suspected that different degrees of heat might have some effect on the refractive power of bodies, but his method of determining the general refraction was not sufficiently accurate to ascertain this circumstance; but happily this method of M. Euler's proved to be well adapted to this purpose.

From his experiments made for this purpose, he infers, that the focal distance of a single lens of glafs diminishes with the heat communicated to it; and this diminution of the focal distance is not owing to the increase of bulk in the glafs by heat; for the effect of this change is both inconsiderable, and of a contrary nature. There can be no doubt, therefore, but that this alteration in the focal distance is owing to a change in the refractive power of the glafs itself, which, as well as, probably, that of all other transparent substances, is increased by heat, and diminished by cold.

It may seem surprizing that the focal distance of a single lens should decrease with heat, and yet that of the meniscus filled with any fluid, should increase with heat; but M. Euler observes, that it by no means follows from hence, that these fluids are affected by heat in a manner different from glafs; and, after computing the effect of every circumstance of this complex experiment, of the two glasses, and the fluid combined, he concludes, that heat increases the refractive power of water, and of other fluids, as well as that of glafs.

He farther observes, that as 66 degrees of heat diminished the focal distance 1/4th part, 33 degrees ought to have diminished it 1/8th part; whereas the diminution in this case was 1/9th. From hence, says he, one may perhaps conclude, that when it is very cold, the same change in the thermometer has a greater effect on the refractive power of the glafs than when it is very hot. But he acknowledges that experiments of this kind are not capable of so much precision as one could wish, and that, perhaps in reality, the 66 degrees made a change of 1/8th, and the 33 degrees of 1/9th; but he imagined that a great number of experiments, made in different temperatures of the air, might decide this question, especially if object-glasses of a very great focal distance were made use of. Ac. Berl. 1762.

The duke de Chauntes, not satisfied with the methods used by Newton and others for determining the refractive power of glafs, proposed another mode of doing it, which is very ingenious, and, when well conducted, promising facs. He formed the glafs into plates, the surfaces of which were truly plane and parallel, and having placed small objects on each of them, he found, by means of a compound microscope, to which he applied the most exquisite micrometer, the different distances at which they were distinctly visible, and compared them with the thicknesses of the glafs. This, he says, gives the proportion of the fines of the angles of incidence and refraction in that kind of glafs directly. In this method he ascertained the mean refractive power of 15 kinds of glafs. Ac. Par. 1767. See Priestley's Hist. of Light, &c. p. 483; &c.

Dr. W. H. Wollaston has proposed a new method of examining refraction as well as dispersive powers, by prismatic refraction. This method was suggested by a consideration of Sir Isaac Newton's prismatic eye-glasses, the principle of which depends on the reflection of light at the inner surface of a dense refracting medium.

Since the range of inclination, within which total reflection takes place, depends not only on the density of the reflecting prismatic, but also on the rarity of the medium adjacent to it, the extent of that range varies with the difference of the densities of the two media. When, therefore, the refractive power of one medium is known, that of any rarer medium may be learned, by examining at what angle a ray of light will be reflected from it.

For instance, when any object is laid under a prism of Flint-glasses, with air alone interposed, the internal angle of incidence at which the visual ray begins to be totally reflected, and at which the object ceases to be seen by refraction, is about 30° 16'. But when the object has been dipped in water, and brought into contact with the glases, it continues visible, by means of the higher refractive power of the water, as far as 56° 52' of incidence. When any kind of oil, or any refrinous cement, is interposed, this angle is still greater, according to the refractive power of the medium employed; and, by cements that refract more strongly than the glases, the object may be seen through the prism, at whatever angle of incidence it is viewed.

In examining the refractive powers of fluids, or of fusable substances, the requisite contact is easily obtained; but, with solids, which in few instances be made to touch to any great extent, this cannot be effected without the interposition of some fluid, or cement, of higher refractive power than the medium under examination. Since the surfaces of a Flattum fork interposed are parallel, it will not effect the total deviation of a ray passing through it, and may therefore be employed without risk of any error in consequence.

Thus, resin, or oil of saffron, interposed between plate-glasses and any other prism, will not alter the result.

If, on the same prism, a piece of selenite and another of plate-glasses be cemented near each other, their powers may
be compared with the same accuracy as if they were both in absolute contact with it.

For such a mere comparison of any two bodies, a common triangular prism is best adapted; but, for the purpose of actual measurement of refractive powers, Dr. Wollaston has preferred the use of a square prism, because, with a very simple apparatus, it shews the fine of refractive power sought, without the need of any calculation.

Let A (Plate XVIII. Optics, fig. 12.) be a square or rectangular prism, to which any refractance is applied at $b$, and let any ray of light parallel to $cb$ be refracted through the prism, in the direction $bc$.

Then, if $ef$ and $ed$ be taken proportional to the lines that represent the refractive powers of the prism and of air, $fg$, which is intercepted between $f$ and the perpendicular $eg$, will be the corresponding line to represent the refractive power of the medium $b$. For since $edg$ (opposite to $ef$) is the angle of refraction, $efg$ (opposite to $ed$) must be equal to the angle of incidence $bdb$; and $ef:fg::bd:db$.

All, therefore, that is requisite for determining the refractive power of $b$, is to find the means of measuring the line $fg$. On this principle, the instrument in fig. 13 is constructed. On a board, $ab$, is fixed a piece of flat deal $c$, to which, by a hinge at $d$, is joined a second piece $d$, 10 inches long, carrying two plane flames at its extremities. At $e$ is a second hinge, connecting $ef$, 15.83 inches long; and a third at the other extremity of $ef$, by which $fg$ is connected with it. At $i$ alio is a hinge, uniting the radius $ig$ to the middle of $ef$; and then, since $g$ moves in a semicircle $egf$, a line joining $e$ and $g$ would be perpendicular to $fg$.

The piece $ef$ has a cavity in the middle of it, so that, when any refractance is applied to the middle of the prism $P$, it may continue to rest horizontally on its extremities. When $ed$ has been so elevated, that the yellow rays in the fringe of colours (observable where perfect reflection terminates) are seen through the flames, the point $g$, by means of a vernier which it carries, shews by inspection the length of the sign of refraction sought.

The advantages which this method possesses above the usual mode of examining refractive powers, are greater than they may at first sight appear. The usual practice has been, to form two surfaces of the refractance under examination, so inclined to each other that the deviation occasioned by them might be measured. The inclination of these surfaces to each other must also be known; and thence the refractive power might be computed. But, in the method here proposed, it is sufficient to have only one surface, and the result is obtained at once, without computation.

The facility of determining refractive powers is consequently such as to render this property of bodies a very convenient test in many philosophical inquiries.

The following table exhibits a series of refractances, arranged according to their refractive powers.

<table>
<thead>
<tr>
<th>Refractive Power</th>
<th>Formula</th>
<th>Refractive Power</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>2.44</td>
<td>Petroleum</td>
<td>1.38</td>
</tr>
<tr>
<td>Plumbago</td>
<td></td>
<td>Fluor spar</td>
<td>1.410</td>
</tr>
<tr>
<td>Native sulphur</td>
<td>2.04</td>
<td>Glafs of opaline</td>
<td>1.08</td>
</tr>
<tr>
<td>Balsam</td>
<td>1.987</td>
<td>Glafs of antimony</td>
<td>1.98</td>
</tr>
<tr>
<td>Jargon</td>
<td>1.95</td>
<td>Spinell rubine</td>
<td>1.811</td>
</tr>
<tr>
<td>Arsenic</td>
<td></td>
<td>White fapir</td>
<td>1.768</td>
</tr>
<tr>
<td>Muriate of antimony, variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gum dragon</td>
<td></td>
<td>Iceland spar, strongest</td>
<td>1.657</td>
</tr>
<tr>
<td>Sulphate of barytes (double)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balsam of Tolu</td>
<td></td>
<td>Horn</td>
<td>1.583</td>
</tr>
<tr>
<td>Guaiacum</td>
<td></td>
<td>Phlophorus</td>
<td>1.579</td>
</tr>
<tr>
<td>Benzoine</td>
<td></td>
<td>Mica</td>
<td></td>
</tr>
<tr>
<td>Flint glafs</td>
<td></td>
<td>Oplum</td>
<td></td>
</tr>
<tr>
<td>Ditto</td>
<td></td>
<td>Amber</td>
<td>1.547</td>
</tr>
<tr>
<td>Horn</td>
<td></td>
<td>Rock crystal (double)</td>
<td>1.547</td>
</tr>
<tr>
<td>Phlophorus</td>
<td></td>
<td>Old plate-glafs</td>
<td>1.545</td>
</tr>
<tr>
<td>Mica</td>
<td></td>
<td>Colophony</td>
<td>1.543</td>
</tr>
<tr>
<td>Oplum</td>
<td></td>
<td>Box-wood</td>
<td></td>
</tr>
<tr>
<td>Amber</td>
<td></td>
<td>Bees-wax</td>
<td>1.542</td>
</tr>
<tr>
<td>Rock crystal</td>
<td></td>
<td>Oil of asphalt</td>
<td>1.536</td>
</tr>
<tr>
<td>(double)</td>
<td></td>
<td>Red sealing-wax</td>
<td></td>
</tr>
<tr>
<td>Old plate-glafs</td>
<td></td>
<td>Sperrmaceti, cold</td>
<td></td>
</tr>
<tr>
<td>Colophony</td>
<td></td>
<td>Sugar, after fusion</td>
<td></td>
</tr>
<tr>
<td>Box-wood</td>
<td></td>
<td>Arlepane of potash</td>
<td></td>
</tr>
<tr>
<td>Bees-wax</td>
<td></td>
<td>Mallic</td>
<td></td>
</tr>
<tr>
<td>Oil of asphalt</td>
<td></td>
<td>Elemi</td>
<td></td>
</tr>
<tr>
<td>White wax (cold)</td>
<td></td>
<td>Oil of cloves</td>
<td>1.535</td>
</tr>
<tr>
<td>Copal</td>
<td></td>
<td>Anime</td>
<td>1.535</td>
</tr>
<tr>
<td>Anine</td>
<td></td>
<td>Radicline crown-glafs</td>
<td>1.533</td>
</tr>
<tr>
<td>Dutch plate-glafs</td>
<td></td>
<td>Pitch</td>
<td></td>
</tr>
<tr>
<td>Human cuticle</td>
<td></td>
<td>Centre of crystaline of fish, and dry crystaline of an ox</td>
<td>1.530</td>
</tr>
<tr>
<td>Gum arabic</td>
<td></td>
<td>Canada balsm</td>
<td>1.528</td>
</tr>
<tr>
<td>Balsam of capivi</td>
<td></td>
<td>Crown glafs, common</td>
<td>1.525</td>
</tr>
<tr>
<td>Oil of amber</td>
<td></td>
<td>Selenite</td>
<td>1.525</td>
</tr>
<tr>
<td>English plate-glafs</td>
<td></td>
<td>Caoutchouc</td>
<td>1.524</td>
</tr>
<tr>
<td>Franco plate-glafs</td>
<td></td>
<td>Gum lac</td>
<td></td>
</tr>
<tr>
<td>Oil of nutmeg</td>
<td></td>
<td>Dutch plate-glafs</td>
<td></td>
</tr>
<tr>
<td>Sulphate of potash</td>
<td></td>
<td>Human cuticle</td>
<td>1.517</td>
</tr>
<tr>
<td>Tallow, cold</td>
<td></td>
<td>Gum arabic</td>
<td>1.514</td>
</tr>
<tr>
<td>Iceland spar, weak</td>
<td></td>
<td>Balsam of capivi</td>
<td>1.507</td>
</tr>
<tr>
<td>Camphor</td>
<td></td>
<td>Oil of amber</td>
<td>1.505</td>
</tr>
<tr>
<td>Linseed oil</td>
<td></td>
<td>English plate-glafs</td>
<td>1.504</td>
</tr>
<tr>
<td>Butter, cold</td>
<td></td>
<td>French plate-glafs</td>
<td>1.500</td>
</tr>
<tr>
<td>Oil of nutmeg</td>
<td></td>
<td>Oil of turpentine, common</td>
<td>1.497</td>
</tr>
<tr>
<td>Sulphate of potash</td>
<td></td>
<td>Oil of turpentine, rectified</td>
<td>1.495</td>
</tr>
<tr>
<td>Tallow, melted</td>
<td></td>
<td>Oil of almonds</td>
<td>1.499</td>
</tr>
<tr>
<td>Lime</td>
<td></td>
<td>Oil of olives</td>
<td>1.497</td>
</tr>
<tr>
<td>Butter, cold</td>
<td></td>
<td>Oil of peppermint</td>
<td>1.493</td>
</tr>
<tr>
<td>Oil of lavender</td>
<td></td>
<td>Oil of lavender</td>
<td>1.493</td>
</tr>
<tr>
<td>Alum</td>
<td></td>
<td>Tallow, melted</td>
<td>1.493</td>
</tr>
<tr>
<td>Spermaceti, melted</td>
<td></td>
<td>Alum</td>
<td>1.486</td>
</tr>
<tr>
<td>Crystalline lens of an ox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computed average of ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphuric acid</td>
<td></td>
<td>Flior spar</td>
<td>1.435</td>
</tr>
<tr>
<td>Nitric acid (sp. gr. 1.48)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
REFRACTION.

Alcohol
White of an egg
Æther
Vitreous humour of an eye
Water
Atmospheric air (Haukhee)


From the law laid down in the beginning of this article, it follows, that one angle of inclination, and its corresponding refracted angle, being found by observation, the refracted angles, corresponding to the several other angles of inclination, are easily computed. Now, Zahnius and Kircher have found, that if the angle of inclination be 70°, the refracted angle will be 38° 50'; on which principle Zahnius has constructed a table of refractions out of air into glafs, for the several degrees of the angle of inclination; a specimen of which follows:

<table>
<thead>
<tr>
<th>Angle of Inclination</th>
<th>Refracted Angle</th>
<th>Angle of Refraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.000032</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hence it appears, that if the angle of inclination be less than 20°, the angle of refraction out of air into glafs is almost one-third of the angle of inclination; and, therefore, a ray is refracted to the axis of refraction, by almost a third part of the quantity of its angle of inclination. And on this principle it is that Kepler, and most other dioptrical writers, demonstrate the refractions in glafs; though in estimating the law of these refractions, he followed the example of Alhazen and VitelHio, and sought to discover it in the proportion of the angles, and not in that of the lines.

The true law of refraction was first discovered by Willebrand Snellius, professor of mathematics at Leyden; who found by experiment that the facets of the complements, or co-facets, of the angles of incidence and refraction, are always in the same ratio. It is vulgarly attributed, however, to Descartes; who having seen it in Snellius's MS., first published it in his Dioptrics, without naming Snellius; as we are informed by Huygens. The form in which Descartes gives this law is different from that of Snellius, and in general more commodious; but it might have been easily deduced from it. According to him, the sine of the angle of refraction always bears the same proportion to the sine of the angle of incidence. Indeed, as the rays of light are not all of the same degree of refrangibility, this constant ratio must be different in different kinds. The ratio, therefore, observed by authors, is to be understood of rays of the mean refrangibility, i.e. of green rays. The difference of refraction between the leaf and most refrangible rays, that is, between violet and red rays, for Isaac Newton fHews is about the 27th part of the whole refraction of the mean refrangible; which difference he owns is so small, that there seldom needs to be any regard paid to it.

3. When a ray paffes out of a denser into a rarer medium, e, gr. out of glafs into air, it is refracted from the perpendicular, or from the axis of refraction. And hence the angle of refraction is greater than the angle of inclination.

Hence, also, if the angle of inclination be less than 30°, MBC (Plate XVIII. Optics, fig. 11.) is nearly equal to one-third of MBE; therefore MBC is one-half of CBE; consequently, if the refraction be out of glafs into air, and the angle of inclination less than 30°, the ray is refracted from the axis of refraction by almost one-half part of the angle of inclination. And this is the other dioptrical principle used by most authors after Kepler, to demonstrate the refraction of glafs.

If the refraction be out of air into glafs, the ratio of the sine of inclination to the sine of the refracted angle is as 3 to 2, or, more accurately, as 17 to 11; if out of air into water, as 4 to 3; therefore, if the refraction be the contrary way, viz. out of glafs or water into air, the ratio of the sines, in the former case, will be as 2 to 3, or 11 to 17, and in the latter as 3 to 4.

Hence, if the refraction be from water or glafs into air, and the angle of incidence or inclination be greater than about 48° in water, or greater than about 40° in glafs, the ray will not be refracted into air, but will be reflected into a line, which makes the angle of refraction equal to the angle of incidence; because the lines of 48° and 40° are to the radius as 3 to 4, and as 11 to 17 nearly, and therefore when the ratio has a greater proportion to the radius than as above, the ray will not be refracted.

4. A ray falling on a curve surface, whether concave or convex, is refracted after the same manner as if it fell on a plane which is a tangent to the curve in the point of incidence.

For the curve and plane surface touching it, have an infinitely small part common to them both (each being originally generated by the flux of a point). But a ray is refracted in such a little part; therefore it is the same as if it were refracted in such a plane.

5. If a right line EF (Plate XVIII. Optics, fig. 14.) cut a refracting surface, GH, at right angles; and if, from any point in the denser medium, as D, be drawn DC parallel to the incident ray AB; this will meet the refracted ray in C; and will be to it as the sine of the refracted angle to the sine of the angle of inclination.

For = x; but if BC pafs out of a denser medium into a rarer, y > x; and out of a rarer into a denser, y < x; therefore, in the former case, y > o, in the latter y < o; consequently, in the former, o + y < y + u; in the latter y + u < o + u. But in the one case o + u, and in the other y + u, are equal to two right angles; therefore, o + u is in this, and y + u in the other, are less than two right angles, and consequently DC will meet BC. But since o = o, or the angle of inclination, and y is the refracted angle, it is evident that CB is to CD as the sine of the angle o to the sine of the angle y, or in the ratio of the sine of the angle of inclination to the sine of the refracted angle.

Hence, if BC pafs out of glafs into air, it is in a subfequaltere ratio to CD; if, on the other hand, it pafs out of air into glafs, it is in a sequequaltere ratio to CD.

Hence, also, if light pafs out of water into air, CB is in a subfalsaquaterian ratio to CD; if out of air into water, in a falaquiterian. See figs. 14 and 15.

REFRACTION in plane surfaces, locus of. 1. If parallel rays be refracted out of one transparent medium into another of a dif-
a different density, they will continue parallel after refraction. The physical reason is, that, being parallel, their obliquity, or angle of incidence, is the same; but, at equal obliquities, we have shewn the refraction is equal; consequently the parallelism, which they had before the refraction, will be retained after it.

But this may be also demonstrated geometrically; thus, if the rays be perpendicular to the refracting surface, they will pass without any refraction; consequently being parallel before their passage, they will be so after it. If they fall obliquely, as A B and C D (fig. 16.), the angles of incidence $\alpha$ and $\omega$, and, consequently, also the angles of inclination $\alpha$ and $\omega$, will be equal. But the sines of the angles of inclination $\alpha$ and $\omega$ have the same ratio to the sines of the refracted angles $m$ and $n$; therefore the refracted angles $m$ and $n$ and also the angles $\alpha$ and $\omega$, are equal; consequently the refracted rays are parallel.

Hence a glass, plane on both sides, being turned directly to the sun, the light passing through it will be propagated after the same manner as if the glasses were away; for the rays being perpendicular, will pass without refraction. If the glasses be turned obliquely to the sun, the light, after refraction, will be of the same intensity as before, the intensity depending on the spiltitude or closeness of the rays, and on the angle with which they strike the object, or the eye; both of which are here unvaried.

2. If two rays D C and C P (fig. 17.) proceeding from the same radiant C, and falling on a plane surface of a different density, so that the points of refraction D and P are equally distant from the catheus of incidence G K, the refracted rays D F and P Q have the same virtual focus, or the same point of dispersion G.

Hence, 1. Since, in rays very near each other, the distance from the catheus is the same as to sense, very near rays will diverge from the same point G, i.e., they have the same virtual focus G.

And hence, 2. When refracted rays, falling on the eye placed out of the catheus of incidence, are either equally distant from the catheus, or very near each other, they will flow upon the eye, as if they came to it from the point G; consequently the point C will be seen by the refracted rays as in G.

3. If a ray C D fall obliquely out of a thinner into a denser medium, having a plane surface, the distance of the radiant point C K will have a less ratio to the distance of the point of dispersion, or virtual focus, K G, than the sine of the refracted angle to the sine of the angle of inclination. But if the distance of the point of refraction, from the catheus of incidence K D, be less than the eleventh or nineteenth part of the distance of the radiant point C K; and if in the former case the tenth, and in the latter the hundredth, part of it be so small, that it cannot be alligned, or need not be minded, then will C K be to K G, as to sense, in the ratio of the sine of the refracted angle, to the sine of the angle of inclination.

Hence, 1. If the refraction be out of air into glass, the distance of the point of dispersion of rays near the catheus is isequiangular of the radiant point; of more remote rays greater than isequiangular. But if the refraction be out of air into water, the distance of the same point will be isequiangular, when the rays are near the catheus; and when more remote, greater than isequiangular.

Hence, 2. If the eye be placed in a dense medium, objects in a rarer will appear more remote than they are; and the place of the image, in any given case, may be determined from the ratio of the refraction. Thus, to fishes swimming under water, objects out of the water must appear farther distant than in reality they are.

4. If a ray D G fall obliquely out of a denser into a rarer medium A B, the distance of the radiant point G K has a greater ratio to the distance of the point of dispersion K C, than the sine of the refracted angle has to the sine of the angle of inclination. In the other case of the preceding theorem, K G will be to K C, as to sense, in the sine of the angle of the refracted angle, to the sine of the angle of inclination.

Hence, 1. If the refraction be out of glass into air, the distance of the point of dispersion of the rays near the catheus of incidence is subsequaler than the distance of the oblique point; that of the more remote rays is less than subsequaler.

But, 2. If the refraction be out of water into air, the distance of the point of dispersion of rays near the catheus is subsequaliter; of those more remote, less than subsequaliter.

And, 3. The eye, therefore, being placed in a rarer medium, objects, placed in a denser, appear nearer than they are; and the place of the image may be determined in any given case by the ratio of refraction. Hence, the bottom of a vessel full of water is raised by refraction to a third part of its height, with respect to an eye perpendicularly over the refracting surface; and hence fishes, and other bodies under water, appear nearer than they really are.

5. If the eye be placed in a rarer medium, an object seen in a denser medium, by a ray refracted in a plane surface, will appear larger than it really is. If the object be in a rarer, and the eye in a denser medium, the object will appear less than it is. And, in each case, the apparent magnitude is to the real one in a ratio compounded of the distance of the point to which the rays tend before refraction, from the refracting surface D E (fig. 18.) to the distance of the eye G L from the same; and of the distance G M of the object A B from the eye, to its distance F M from a point F, to which the rays tend before refraction.

Hence, 1. If the object A B be very remote, F M will be physically equal to G M; and, therefore, the real magnitude M B is to its apparent one M H, as G L to F L, or the distance of the eye G from the refracting plane to the distance of the point of convergence F from the same plane.

Hence, 2. Objects under water, to an eye in the air, appear larger than they are; and to fishes under water, objects in the air appear less than they are.

REFRACTION. Law of, in spherical surfaces, both concave and convex. 1. A ray of light D E (fig. 19.) parallel to the axis of a denser sphere, after a single refraction in E, falls in with the axis in the point F, beyond the centre C.

For the semidiameter C E, drawn to the point of refraction E, is perpendicular to the surface K L, and is therefore the axis of refraction; but a ray out of a rarer into a denser medium, we have shewn, is refracted towards the perpendicular, or the axis of refraction; therefore the ray D E will converge to the axis of the sphere A F; and will, therefore, at length concur with it, and that beyond the centre C, in F; because the angle of refraction F E H is less than the angle of inclination C E H.

2. If a ray D E fall on a spherically convex surface of a denser medium, parallel to its axis A F; the semidiameter C E will be to the refracted ray E F in the ratio of the sine of the angle of refraction, to the sine of the angle of inclination; but the distance of the focus, or point of concurrence from the centre C, is to the refracted ray F E, in the ratio...
ratio of the sine of the refracted angle, to the sine of the angle of inclination.

3. If a ray D E fall on a denser spheric surface K L, parallel to the axis A F, the distance of the focus from the refracting surface F B must be to its distance from the centre F C, in a ratio greater than that of the sine of the angle of inclination, to the sine of the refracted angle. But if the rays be very near the axis, and the angle B C E be very small, B F will be to C F very nearly in the ratio of the sine of inclination, to the sine of the refracted angle.

Hence, 1. If the refraction be out of air into glass; in the case of rays near the axis, F B : F C :: 3 : 2; in the case of rays more remote from the axis, F B : F C :: 3 : 2 ; consequent, in the former, B C : F C :: 1 : 2. And hence, in the latter, B C : F C < 1 : 2.

Hence also, 2. If the refraction be out of air into water; in the case of rays near the axis, F B : F C :: 4 : 3. In the case of rays more remote from the axis, F B : F C > 4 : 3 ; consequent, in the first case, B C : F C :: 1 : 3. And hence, in the latter, B C : F C > 1 : 3.

And hence, 3. Since the point of refraction F is farther from the centre C, if the refraction be in water than in air, rays will be less deflected in the latter case than in the former.

8. If the ray H E (fig. 20.) fall parallel to the axis A F, from a denser upon the surface of a spheric concave rarer medium, the refracted ray will concur with the axis A F, in the point F; fo that the distance of the point of confluence from the centre C F, may be to the refracted ray to E, in the ratio of the sine of the refracted angle, to the sine of the angle of inclination.

9. If a ray H E fall parallel to the axis A F on the concave surface of a rarer medium out of a denser, the distance of the focus from the centre F C will be to its distance from the refracting surface F B in a greater proportion than the sine of the refracted angle, to the sine of the angle of inclination. But if the rays be very near the axis, F C will be to F B in the proportion of these lines.

Hence, 1. If the refraction be out of glass into air; in the case of rays near the axis, F C : F B :: 3 : 2; in the case of rays more remote from the axis, F C : F B > 3 : 2 ; whence, in the former case, B C : F B :: 1 : 2.

2. If the refraction be out of water into air; in the case of rays near the axis, F C : F B :: 4 : 3; in the case of rays more remote, F C : F B :: 4 : 3 ; whence, in the former case, B C : F B :: 1 : 3. For the demonstration of these several laws of refraction, we refer to Wollaston's Elem. Math. &c. tom. iii. p. 179, &c. See also, LENS.

Refraction in a glass prism. If a ray of light D E (fig. 21.) fall obliquely out of air on a prism A B C; being refracted towards the perpendicular, instead of proceeding to F, it will decline to G, i.e. towards a line H I, drawn perpendicular to the surface A B in the point of refraction E. Again, since the ray E G, passing out of the glass into air, falls obliquely on C B, it will be refracted to M, fo as to recede from the perpendicular N G O. And hence arises the various phenomena of the prism. See COLOUR and REFRANGIBILITY.

Refraction in a convex lens. If parallel rays, A B, C D, and E F (fig. 22.) fall on the surface of a lens 2 B 3 K, the perpendicular ray A B will pass unrefracted to K, where it will proceed straight to G. But the rays C D and E F, falling obliquely out of air into glass, in D and F, will be refracted towards the axis of refraction (i.e. towards lines H I and L M, drawn perpendicular to the refracting surface in the points of refraction D and F) and decline to Q and P. Again, emerging obliquely out of the glass into the surface of the air, they will be refracted from the perpendicular, and, therefore, D Q will not proceed to X, but to G; and F P, not to V, but to G; thus, likewise, might all the other rays, falling on 4 F the
the surface of the glass, be shewn to be refracted so as to
meet the ref about the point G. See Focus and Lens.
Hence the great property of convex glasses; viz., that they
collect parallel rays, or make them converge into a point.

Refraction in a concave lens. Parallel rays A, B, C, D,
and E (fig. 23.) falling on a concave lens G B H I M K,
the ray A B, falling perpendicular on the glasses at B, will
pass unaltered to M; where being still perpendicular, it
will pass into the air without refraction, to L. But the
ray C D, falling obliquely on the surface of the glass, will
be refracted towards the perpendicular N D O, and proceed to
Q; and the ray D Q, again falling obliquely out of the
glasses upon the surface of air, will be refracted from the
perpendicular Q R S, and proceed to V. After the same
manner might the ray E F be shewn to be refracted to V,
and thence to Z.

Hence the great property of concave glasses; viz., that they
disperse parallel rays, or make them diverge. See Lens and
Mirrors.

Refraction in a plane glass. If parallel rays E F, G H,
I L (fig. 24.) fall obliquely on a plane glasses A B C D, the
obliquity being the same in all, by reason of their parallelism,
they will be all equally refracted towards the perpendicular;
and accordingly, being still parallel at M, O, and Q, they
will pass out into the air equally refracted again from the
perpendicular, and still parallel.

Thus will the rays E F, G H, and I L, at their entering
the glasses, be inflected towards the right; and in their going
out as much inflected to the left; so that the first refraction
is here undone by the second; though not so as that the ob-
ject is seen in its true place. For the ray B Q, being produced
back again, will not coincide with the ray L I, but will fall
to the right of it; and this the more as the glass is thicker;
however, as to matter of colour, the second refraction does
really undo the first. See Colour.

Refractive of Heat. See Heat, Light, and Rays of
Heat.

Refractive in Iceland or Island glass. See Iceland
Crystal. Dr. Young, who maintains that radiant light
consists in undulations of the luminiferous ether, takes
occasion to make some remarks on Sir Isaac Newton’s theory
of the peculiar refraction in Iceland crystal. Newton, he
says, has advanced the singular refraction of the Iceland
crystal, as an argument that the particles of light must be
projected corpuscles; since he thinks it probable that the
different sides of these particles are differently attracted by
the crystal, and since Huygens has confuted his inability to
account, in a satisfactory manner, for all the phenomena.
But contrary to what might have been expected from New-
ton’s usual accuracy and candour, he has laid down a new
law for the refraction, without giving a reason for rejecting
that of Huygens, which Mr. Hâyi found to be more
accurate than Newton’s; and, without attempting to deduce
from his own system any explanation of the more universal
and striking effects of doubling spars, he has omitted to ob-
serve, that Huygens’s most elegant and ingenious theory per-
fectly accords with these general effects, in all particulars,
and of course derives from them additional pretensions to
truth; this he omits, in order to point out a difficulty for
which only a verbal solution can be found in his own theory,
and which will probably long remain unexplained by any
other.

Dr. Wollaston, in his paper on the oblique refraction
of Iceland crystal, confirms the experiments of Huygens on
this subject, with additional evidence, deduced from the
superiority of his mode of examining the powers of re-
fration. He observes that Dr. Young has already applied
the Huygenian theory with considerable success to the ex-
planation of several other optical phenomena, and that it
appears to be strongly supported by such a coincidence of
the calculations deduced from it, with the results of these
experiments, as could have scarcely happened to a false theory.

In ordinary cases, the incident undulations are of a sphé-
rical form; but in the Iceland crystal light appeared to Huy-
gens to proceed as if the undulations were portions of an ob-
late spheroid, of which the axis is parallel to the short dia-
gonal of an equilateral piece of the crystal, and its centre
the point of incidence of its ray. From this spheroidal
form of the undulations, he deduces the obliquity of refra-
tion; and lays down a law observable in all refractions, at
any surface of the spar, whether natural or artificial, which
bears the clearest analogy to that which obtains, universally,
at other refractory surfaces; for as, in other cases, the ratio
is given between the sine of incidence and sine of refraction,
(or ordinate of the spheroidal undulation propagated,) in the
Iceland crystal, the ratio between the sine of incidence
and ordinate of refraction (in any one section of the sphenoi-
ral undulation) in a given ratio, but different in different
planes.

Dr. Wollaston observes, that though we do not fully
understand the existence of a double refraction, and are
utterly at a loss to account for the phenomena occurring
upon a second refraction, by another piece of the spar, yet
that the oblique refraction, when considered alone, is nearly
as well explained as any other optical phenomenon. Phil.
Trans. for 1801 and 1802.

Refractive, Partial laws of, in different kinds of
leaves; see Lens.

Refractive, Atmospheric, is generally considered under
two distinct heads; viz., astronomical refraction, which is
that relating to the refraction of the moon, stars, and other
celestial bodies; and terrestrial refraction, or that which
takes place in terrestrial observations.

It appears, from the article Refraction, that a ray of
light is refracted in passing obliquely out of one medium into
another of different density; and as the atmosphere may be
considered as composed of an infinitude of strata, whose
density increase as they are poluted nearer the earth, the lu-
minous rays which pass through it are acted on as if they
palled successively through media of increasing density, and
are therefore refracted more and more towards the earth, as
the density augments, that is, as they approach the eye of
the observer. In consequence of this it is, that rays from
objects, whether celestial or terrestrial, proceed in curves
which are concave towards the earth; and since the mind al-
ways refers the place of objects to the direction in which
the rays reach the eye, that is, to the direction of the tan-
gent to the curve at that point, it follows, that the apparent
or observed elevation of objects is always greater than the
true one, at least with the exception of some few remark-
able anomalies which sometimes, in terrestrial observations,
produce a contrary effect, and of which we have stated a
few particular instances under the article Mirages, and on
which subject some other curious facts are recorded in a me-
moire of professor Vince’s, in the Phil. Trans.; in Nicholson’s
Philosophical Journal, 4to; and more particularly by M. Monge,
in vol. i. of the “Decade Egyptienne.” Ref-
erring the reader therefore to those works, to which we
ought also to add the memoir by M. Biot, in vol. 8. of the
National Institute, for an account and explanation of those
phenomena, we shall confine our present observations to those
cases only, in which an uniform law is supposed to have place,
and which, as we have seen, has a constant tendency to aug-
ment the observed altitude of both terrestrial and celestial
objects.
objects. In order to submit the phenomena of refraction to strict mathematical investigation, it must be observed that, in consequence of the inconsiderable height of the atmosphere, and its spherical form, a luminous ray impinging upon it, even in the most unfavourable case, that is directly in the horizon, traverses only a small quantity of this medium; and in this case, if the atmosphere be calm, the density of the air at equal heights above the level of the sea is everywhere the same. Therefore, in supposing the earth spherical, a supposition which may be admitted, in the present case, without any sensible error, we may consider the atmosphere as composed of successive spherical concentric shells, or strata, of which the density diminishes from the surface of the earth upwards.

Let us conceive, now, a luminous ray, coming from a distance, to penetrate into one of the supposed spherical shells; then, if through the common centre of these shells, which is the same as the centre of the earth, we suppose a plane to pass in the direction of the luminous ray, the spherical beds of the atmosphere will be found divided into two equal portions, which acting equally upon the ray, can produce no deviation of it from that plane; whence it follows, that the effect of refraction is entirely produced in a vertical direction, and in such a manner as to augment the apparent altitudes of the heavenly bodies, and consequently to diminish their zenith distances.

But the intensity of these effects will not be the same at all heights, for we know that in all cases the quantity of refraction depends upon the obliquity of incidence, and therefore the refraction in the zenith is equal to zero, and increases from that point to the horizon, where it is the greatest.

If now, we knew the law by which the density of the air is diminished in ascending from the earth, that is, if we knew the difference in the density of any two consecutive strata, it would be comparatively a direct and easy problem to find the whole amount of refraction for any given angle of observation; but unfortunately the uniformity of decrease in the density of the atmosphere, which, according to theory, is in geometrical progression, is so much interrupted by the multitude of causes which may tend to produce this effect, that it is found that the quantity of refraction computed on this principle will by no means agree with that deduced from actual observation. It has been, however, demonstrated, that the quantity of refraction, in all cases exceeding 10 or 12 degrees of elevation, is not sensibly affected by any irregularity in the law of density, in the strata of which we have suppos'd the atmosphere to be composed, but that it depends simply upon its pressure and temperature at the time and place of observation, which are indicated at the time by the barometer and thermometer.

It was formerly thought, also, that refraction was influenced by the degree of humidity and dryness of the air; but from a great variety of interesting and accurate experiments, carried on by M. M. Biot and Arrago, it appears indubitably established, that no sensible effect is thence produced. See a memoir on this subject by the former author, in vol. x., of the National Institute.

But before we proceed farther on this interesting subject, it will be proper to give a sketch of the several improvements which the theory has experienced in the hands of different celebrated astronomers; in doing which we shall avail ourselves of a memoir, published by Dr. T. S. Evans in the Philosophical Magazine, which contains a minute and circumstantial detail of many important particulars connected with this subject. There appears to be but little doubt that the astronomic refraction was known to the ancients, since it is expressly mentioned by Ptolemy, although not made use of in his calculations. He says, near the end of the 8th book of the Almagest, that in the rising and setting of the heavenly bodies, there are changes which depend upon the atmosphere, and he mentions it more at length in a work on optics, which, unfortunately, has not been handed down to us. Alhazen, an Arabian writer, who is generally supposed to have lived about the year 1000, and to have taken the greater part of his optics from the works of Ptolemy, speaks also decidedly of it, and shews the manner of convincing ourselves of it by experiment. "Take," says he, "an armillary, which turns round its poles, and measure the distance of a star from the pole of the world when it passes near the zenith in the meridian, and when it is rising or setting near the horizon, and you will find the distance from the pole less in the latter case." He then demonstrates that this must arise from refraction, but he does not state its quantity.

In the collection of observations made by Bernard Walter, and published by Willebrode Snell in 1618, it is stated, that the observations were so exact, that they pointed out to Walter the quantities by which the altitudes of the stars and planets were increased on account of the refraction.

Tycho Brahe, however, appears to be the first who, with any degree of accuracy, that the refraction elevates the heavenly bodies rather more than half a degree when on the horizon. (See Progymn. p. 15.) But either his instruments or his observations were not sufficiently correct to determine it with certainty for all degrees from the zenith to the horizon; and, accordingly, where these failed, the result was supplied by conjecture. He believed that the sun's refraction was 34" in the horizon, and that it became sensible at 45° of altitude. For the stars, however, he ascribed an entirely different quantity, viz. 30" in the horizon; but this, according to him, terminated at only 20° of altitude.

The following is the manner in which it is related (Encly. Method.) that Tycho made this discovery. He had determined, with one or two instruments, extremely well made, the latitude of the place by observations of Polaris above and below the pole. He determined it also by the sun's altitude in both solstices, and found it four minutes less in the latter. At first he doubted the goodness of his instruments, and therefore constructed, with the utmost care, as many as ten others, of different sizes and forms, but they all gave nearly the same results. He could, therefore, no longer attribute this difference in the two determinations of the latitude to any defect in the observations, but endeavoured, by an attentive consideration of the subject, to find out the cause of this singular phenomenon. At length he suppos'd it could only arise from the refraction which elevated the sun at the winter solstice, having then only 11° of elevation above the horizon. This result agreed very well with the principles of optics; but still Tycho Brahe could scarcely persuade himself that the refraction was sufficiently large to produce so great a difference. On this account, he made other observations of the ten feet diameter, whole axes corresponded exactly with the pole of the world, and with these he measured the declination of the stars out of the meridian. He then found, that even in summer the refraction, although sensible at the meridian altitude of the sun, was very considerable near the horizon, and amounted to half a degree in the horizon. See Progymn. p. 79-104. Street's Alfr. Carol. p. 119.
REFRACTION.

Tycho Brahe’s table of refraction is as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>30° 00″</td>
<td>10°</td>
<td>5 00″</td>
</tr>
<tr>
<td>1</td>
<td>21° 30″</td>
<td>11</td>
<td>4 30″</td>
</tr>
<tr>
<td>2</td>
<td>15° 30″</td>
<td>12</td>
<td>5 30″</td>
</tr>
<tr>
<td>3</td>
<td>12° 30″</td>
<td>13</td>
<td>4 00″</td>
</tr>
<tr>
<td>4</td>
<td>11 40″</td>
<td>14</td>
<td>3 00″</td>
</tr>
<tr>
<td>5</td>
<td>10 00″</td>
<td>15</td>
<td>2 00″</td>
</tr>
<tr>
<td>6</td>
<td>9 00″</td>
<td>16</td>
<td>1 00″</td>
</tr>
<tr>
<td>7</td>
<td>8 15″</td>
<td>17</td>
<td>1 30″</td>
</tr>
<tr>
<td>8</td>
<td>6 45″</td>
<td>18</td>
<td>1 15″</td>
</tr>
<tr>
<td>9</td>
<td>6 00″</td>
<td>19</td>
<td>0 30″</td>
</tr>
<tr>
<td>10</td>
<td>5 30″</td>
<td>20</td>
<td>0 00″</td>
</tr>
</tbody>
</table>

In this state the refraction remained for many years. Even Riccioli, in 1665, supposed it nothing at about 26° of altitude; but he thought the moon had only 20″ of horizontal refraction in summer, the sun 30°, and the stars 3° 37″. It was not till after the year 1672, that a tolerably near table of refraction made its appearance, when the elder Caffini took the subject into consideration. (Mem. de l’Acad. tom. v. p. 81.) What led to this was the voyage of Richer to Cayenne in that year, upon the utility of which some very excellent remarks were made by Caffini, shewing how far observations made in a situation so near the equator tended to confirm or disprove certain theories derived from observations made in Europe. Several very useful deductions were drawn from a comparison of those made both at Paris and Cayenne; among others, the refraction was settled upon much more accurate elements than hitherto, and a new table computed, for the first time, of its quantity, for all degrees, up to the zenith; an abridgment of which is given below:

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>32° 20″</td>
<td>1</td>
<td>42°</td>
</tr>
<tr>
<td>1</td>
<td>27° 56″</td>
<td>2</td>
<td>41°</td>
</tr>
<tr>
<td>2</td>
<td>21° 04″</td>
<td>3</td>
<td>40°</td>
</tr>
<tr>
<td>3</td>
<td>16° 05″</td>
<td>4</td>
<td>39°</td>
</tr>
<tr>
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<td>12° 43″</td>
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<td>10° 38″</td>
<td>6</td>
<td>37°</td>
</tr>
<tr>
<td>6</td>
<td>8° 28″</td>
<td>7</td>
<td>36°</td>
</tr>
<tr>
<td>7</td>
<td>6° 12″</td>
<td>8</td>
<td>35°</td>
</tr>
<tr>
<td>8</td>
<td>4° 00″</td>
<td>9</td>
<td>34°</td>
</tr>
<tr>
<td>9</td>
<td>2° 39″</td>
<td>10</td>
<td>33°</td>
</tr>
</tbody>
</table>

From the relation of his grandson it appears, however, that Caffini had at one time computed three tables of refraction for all altitudes; one for winter, another for summer, and a third for spring and autumn; but several doubts having been suggested to him respecting this arrangement, although in appearance conformable to nature, and principally the observations of Richer at Cayenne, where the refraction was found little different from that at Paris, he changed his opinion; and judging, that since the great difference of heat of the torrid zone from that of the temperate zone, which we inhabit, does not cause sensible differences in the refraction; therefore the greatest heat or cold of our climate could not change it much; and he then fixed upon one table, which was that used by the astronomers of the Royal Observatory of Paris up to the year 1745.

It was always thought, before the time of Caffini, that the refraction did not extend its influence higher than 45° of altitude; and he is generally considered as the first who proved that it reached all the way to the zenith. He also supposed that near the equator the horizontal refraction was less than in our climate by about one-third; that this difference decreased as far up as 60°, after which it was the same nearly for both climates.

From this discovery it followed, as a natural consequence, that the refraction must be greater near the pole than at Paris; and this was shortly afterwards proved to the Academy by the publication of a work expressly on that subject. (Refraction, folia inedita, &c. Holmiae, 1695.) The king of Sweden, being, in 1692, at Tornes, in West Bohemia, near the latitude of 65° 45′, and observing that the sun did not set there in the summer solstice, sent the following year some mathematicians to make more certain and exact observations of this curious phenomenon. They are contained in this book, and Meffrs. Caffini and Del la Hire concluded from them, that in the latitude of 65° 45′, the horizontal refraction must be 58′, or nearly double of that at Paris.

According to an observation made by some Dutchmen who passed the winter of 1596—7, in Nova Zembla, in latitude 76° north, the sun, which had entirely disappeared the 14th of November, began to rise again the 24th of January, viz. fix days sooner than was expected, according to astronomical calculations. If so, when the sun has been two or three months under the horizon, as the Dutchmen observed in 1597, the cold becomes dreadful, and perhaps the refraction increases prodigiously. M. le Monnier affirms us, that he found by the observations printed in 1599, that on the 24th and 25th of January 1597, there were more than 45 degrees of refraction; that he could neither explain these observations, reject them as doubtful, nor suppose any error, as was done by most of the other astronomers, Kepler, Caffini, Scotto, and, lastly, M. le Gentil, in his Voy. dans les Mers des Indes, tom. i. p. 395, tom. ii. p. 532, who maintained that there were errors in the observations, and accordingly read a memoir on the subject. If it were not so difficult a task to winter in these high latitudes, we might expect such observations as would remove all doubt on the subject; and, perhaps, bring others to light of as great or greater importance.

The refraction of the north being so considerable, is very useful to the inhabitants, who are deprived of the sun’s light during many months; as it makes the sun rise much earlier, and set much later to them, than it otherwise would.

About the year 1725, Mr. Flamsteed, the English astronomer royal, published his table computed from his own observations: and this was the one commonly used in England for many years afterwards.

Sir Isaac Newton also constructed one from theory, which was first published by Dr. Halley in the Philosophical Transactions, N°. 568, for 1721. He made the horizontal refraction 33° 45′; whereas Mr. Flamsteed’s was only 33° 00′.

But although the refraction might be determined within a few seconds at all altitudes by observation; yet, the law of its increase from the zenith to the horizon was a subject that occupied the principal mathematicians and astronomers for more than a century. Newton having discovered the general principles of attraction, found that the refraction was a consequence of this law of gravity; and that it arose from the attraction of the atmosphere on the particles of light. On this principle the curve which a ray of light describes might be determined: since it is successively attracted
The refraction of the variation of density in the atmosphere, as indicated by the barometer and thermometer, is due to Neîfss, Lotthorpe and Haukseb; the former of which, in 1698, proved by a very simple experiment, in the presence of the Royal Society, that the refractive power of air is directly proportional to its density: and the latter, by repeating and extending the same course of experiments in the year 1708, with the machinery pointed out by the former, found that the variations of refraction, depending on the barometer, are proportional to the alteration of height of the mercury in the tube: and by a series of these experiments, he furnished us with a table of the corrections which it is necessary to make on account of the changes of heat indicated by the thermometer. These experiments, although not quite conclusive on the subject, were yet made with as much accuracy and care as the nature of the machinery, and the rate of experimental philosophy of that time, would admit. An example is also given, towards the end of his paper, on the mode of applying them to correct the refraction. By these, Haukseb found that a volume of air expressed by unity, when the thermometer was at 180° above zero, became, at 50° below, one-eighth more dense: or, which is the same thing, that the air lost one-eighth of its density, for an elevation of 180° of Fahrenheit's thermometer; which is exactly the difference of heat between melting ice and boiling water. But although this one-eighth, as will be shewn hereafter, was too small; yet it laid the foundation for other experiments, since made by several philosophers, by which the quantity of expansion has been determined more accurately.

We have already shewn that the refraction near the pole is greater than in our climate; the degree of cold being more intense. It was also found to be less in the torrid zone, where the heat is greater than in Europe. Bouger made a variety of observations at Peru, the result of which he has given us. In 1740, he came down into an island situated in the river of Emerals, called Isla de Inca, where he determined the refraction from 1° to 7° of altitude; and the table which he afterwards computed shews the refraction to be about one-seventeenth less than in Europe. The horizontal refraction he found to be 27'; but at 6° of altitude it is 7° 45': and at 9° it is 4° 54'. Bouger then gives a table for Quito, which is much more elevated above the level of the sea. M. le Gentil found it greater at Pondicherry in India, although in the torrid zone.

The refraction diminishes when we are elevated above the level of the sea. Bouger observed the quantity of it at Chimbapora, 2388 toises above the level of the sea, and found it in the horizon only 192'. At the croots of Pitcairia, 2044 toises above the sea, he found it 20° 45'; at Quito, 1479 toises above the sea, 22° 50'; but at the level of the sea 27°. These observations, when joined with the theory, produced the following rule: viz. if we take the excess of 5158 toises above the elevation of the place, with regard to the level of the sea, the refraction will be as the square root of this excess. Thus the square root of 5158 toises above the elevation of the place, with regard to the level of the sea, the refraction will be as the square root of this excess. Thus the square root of 5158 above the elevation of the place, with regard to the level of the sea, is 7° for the horizontal refraction, at the level of the sea, in the torrid zone: and the square root of the excess of 5158 above the elevation of the place will be its horizontal refraction. The quantity 5158 is the height above which the refractive matter no longer produces any sensible effect, at least in the torrid zone.

But although by this time considerable attention had been paid to the subject, yet great differences were to be found in the tables then most in use. Thus at the altitude of 50°, according to Flamstead, the refraction was 1° 23'; Newton, 1° 30'; Cassini, 1° 42'; and de la Hiere, 1° 55': leaving an uncertainty of more than half a minute: and it must have been very mortifying to an observer, after having taken the utmost
REFRACTION.

utmost pains to avoid errors of two or three seconds, to
find his reduced observations liable to so great an error, ac-
cording to the choice of his table of refraction

It is indeed rather extraordinary, that in a memoir pub-
lished by Caffini de Thury, among those of the Academy,
for 1745, he attempted to reconcile a number of observa-
tions with each other, by considering the rate of the thermometer
only, without at all noticing that of the barometer; al-
though at that time Hankkée's experiments had been
published about 37 years.

He concludes his paper, as is very natural to suppose,
without being able to make the observations agree; for
it does clearly appear that the French noticed the above-
mentioned experiments made by Hanskée till about the
year 1749. It is also worthy of remark, that although the
necessity of introducing corrections on account of the alter-
ations of the barometer and thermometer were likewise
shown to be absolutely necessary by Dr. Halley (Phil. Trans. 
N° 364), and the circumstance mentioned, and in some de-
gree admitted by Le Monnier (Hist. Celest.), yet it does not
appear that he followed the advice of his illustrious con-
temporary, but merely endeavoured, as Caffini did, to
reconcile his observations with the rate of the thermostat
at the time of making these observations, without taking the
barometer into account.

It would be endless to notice the different opinions re-
flecting both the terrestrial and the astronomic refraction
which are to be met with in the writings of various authors
on the subject: and it would be equally useless to notice all
the tables of its quantity given by them, some of which dif-
fer very much from others. It will be sufficient to mention
those only who made some considerable advances towards
obtaining it with greater accuracy.

The next of these in order was La Caille (Mem. de l'Ac. de 
Sc. 1755, p. 547.), who in determining it certainly bellowed
very great pains, by making and reducing an immense number
of observations, and afterwards comparing them with others
made at Greenwich by Dr. Bradley, at Gottingen by Mayer,
at Bologna by Zanotti, and by La Lande, who was then at Berlin.
From these it appeared that the refraction at 45° of altitude was
1' 51"; but this, as will hereafter be seen, was too great by five
seconds. In his paper on the subject, which is divided into four parts, he proves, first,
that the mean refractions are very nearly the same for the
same apparent altitudes throughout the whole extent of the
temperate zone; since those which were observed at Paris
did not exceed those observed at the Cape of Good Hope
but by 1" at most. In the second he determines the abso-
lute quantity of the mean refraction for the apparent height
of the pole at Paris, and gives the result of his observations
with regard to the latitude of Paris and of the Cape of
Good Hope. In the third he gives his table of mean re-
fraction, and another of corrections depending upon the
rate of the barometer and thermometer; concluding with
some reflections on its construction and use. In the fourth
he compares his new table with the most celebrated of those
that had before that time been in use among astronomers;
and he then shews how it agrees with the observations
of Bradley, Zanotti, and Mayer.

But by La Caille's memoir it appears, that previous to
this time M. Mayer had formed and communicated to him a
table of astronomic refractions which he computed by means
of an algebraic formula, the coefficients of which he de-
duced from his own observations, and took into account the
variations relative to those of the barometer and thermometer.
He found the alteration of refraction for a depression
of 15 minutes in the barometer, the same as for a rise of 10°
in the thermometer, and the variation for each degree of
the latter, according to his table, 1/4 of the whole mean
refraction, which he adopted for 28 inches of the barometer,
and 5° of the thermometer. This proportion takes place
down to 30° of zenith distance. Mayer considered also
that the mean refraction is the same for all parts of the earth;
and that the only variation which takes place depends on
the changes of the weight and temperature of the
atmosphere.

La Caille, in comparing Mayer's table with observations,
found that his correction for the thermometer was a little
over-rated; and accordingly, for his new table, altered it
at 45° for each degree. And here it may be observed that
La Caille did not correct his altitudes above 35° at Paris,
and 30° at the Cape; firstly, because he only noted the baro-
meter and thermometer in the night, when he observed stars
below 30° of altitude. Secondly, because, at 36° of altitude,
where the mean refraction is about 1/4 minute, the variation
which belongs to 10° of the thermometer only amounts to 3/4
seconds; a quantity about equal to the limits of the errors of observations made with an instrument
of six feet.

The formula given by Euler (Mem. de l'Ac. de Berlin, 
1754, p. 131.), appeared also about this time. It took into
account the variation of the refraction depending upon
the thermometer and barometer, but was certainly too
complicated to be generally adopted. He shews, however,
that in very different hypotheses the refraction will be suf-
ficiently exact, if taken in the inverse ratio of the degrees
of heat, when the star or planet is not too near the
horizon, but the precise quantity of this ratio was unknown
to him.

In this state the refraction stood when Dr. Bradley took
the subject into consideration, and began to find its quantity
from his own observations. The rule which he adopted,
although a very elegant one, he neither lived to complete
nor to present to the world; but it was published after his
death by Dr. Markelyne, (Pref. to fold. vol. of Obs. 1765,
Phil. Trans. 1764 and 1787, p. 157. Req. Tables, &c.),
and has commonly been used in England up to the present
time. He found the mean refraction at 45° of altitude
57°, and, that at all other altitudes, it was equal to 57°
multiplied by the tangent of the zenith distance, diminished
by three times the refraction. Then supposing the mean
flats of the atmosphere to be at 29.6 inches of the baro-
meter, and 30° of Fahrenheit's thermometer, he made the
true or corrected refraction equal to 57° × t, (Z. D. − 3r)
barom. × 29.6 330 + ther., where it is to be understood
that the mass of air is supposed to increase in bulk 3/4
for each degree of Fahrenheit's scale.

A variety of experiments has been made at various
times to ascertain the increase in bulk or a quantity of air
represented by unity for a certain number of degrees of rise
of the thermometer. The following is a list of some of them:

<table>
<thead>
<tr>
<th>Author</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. Bonne</td>
<td>1.00 25777</td>
</tr>
<tr>
<td>Bradley</td>
<td>1.00 25000</td>
</tr>
<tr>
<td>Dalton</td>
<td>1.00 26701</td>
</tr>
<tr>
<td>De Luc</td>
<td>1.00 20888</td>
</tr>
<tr>
<td>Fahrenheit</td>
<td>1.00 25777</td>
</tr>
<tr>
<td>Gay Lussac</td>
<td>1.00 20868</td>
</tr>
<tr>
<td>Groomebridge</td>
<td>1.00 21000</td>
</tr>
<tr>
<td>Haarkbee</td>
<td>1.00 26933</td>
</tr>
<tr>
<td>La Caille</td>
<td>1.00 22222</td>
</tr>
<tr>
<td>Mayer</td>
<td>1.00 20444</td>
</tr>
<tr>
<td>Shuckburg</td>
<td>1.00 22222</td>
</tr>
<tr>
<td>Mean of all except Haarkbee's</td>
<td>1.00 22490</td>
</tr>
</tbody>
</table>
The refraction deduced from Bradley's very neat and simple formula was, in a few years, adopted by nearly all the astronomers of eminence throughout Europe. The extreme facility with which it might be computed, and the corrections applied, whether from the formula itself, or from tables ready calculated for that purpose, was a powerful recommendation in its favour; but its near agreement with observation soon established it.

We must now, without entering farther into detail of minor improvements, proceed at once to the chapter given by La Place on this subject, in his "Mécanique Céleste," vol. iv. p. 234, where he has drawn, from an investigation which we cannot undertake to exhibit in this place, the following general formula, for expressing the refraction for all angles of elevation above 12 decimal, or 10.8 sexagesimal degrees, viz.

\[ r = \frac{a \rho \cdot \tan \alpha}{0.76 \left(1 + \frac{0.00125354}{\cos^2 \alpha}\right) - 0.76 \cdot \cos^2 \alpha} + \frac{0.5 a' \sin \tan \alpha}{\left(1 + \frac{0.00125354}{\cos^2 \alpha}\right) \tan \alpha} \]


where all the quantities are known except \( r \) and \( \alpha \); which latter represents a constant co-efficient; viz. \( r \) is the observed zenith distance under the barometric pressure \( \rho \), in metres, and \( \alpha \) the temperature of the centigrade thermometer, \( r \) being the refraction; all, therefore, that is required for determining \( r \), is the value of the unknown co-efficient \( a \), which is to be drawn from observations on the circumpolar stars, in the following manner.

Let \( Z \) be the distance of one of these stars from the zenith, in its superior meridian passage; \( Z' \) this distance at the inferior meridian passage, observed from the same point of the terrestrial surface; \( r \) and \( r' \), the corresponding refractions. Now all the other quantities, except \( a \), being known, we may, for the sake of simplicity, put the above formula for both passages under this form,

\[ r = A a + B a', \quad r' = A' a + B' a' \]

where \( A, B, A', B' \) are all known quantities. Writing for \( Z \) and \( Z' \), for the observed zenith distances, the true zenith distance, \( D \), corrected for refraction, will be

\[ Z + A a + B a', \quad Z' + A' a + B' a' \]

which are, therefore, now equal to each other; consequently, by addition, we have

\[ Z + Z' + (A + A') a + (B + B') a' = 2 D \]

in which all the quantities are known, except \( a \) and \( D \). But by repeating similar observations on some other star, and denoting by \( Z'', Z''', A'', A''', B'', B''' \), the similar quantities before referred to by \( Z, Z', A, A', B, B' \), the following two equations will be obtained:

\[ Z'' + Z''' + (A'' + A''') a + (B'' + B''') a' = 2 D \]

from which it is obvious, the constant co-efficient \( a \) may be obtained by the usual methods of elimination.

In the above operation, however, we have supposed the polar distances of the same star to be the same for its superior and inferior passage; whereas we know that, in consequence of the effect of precession, nutation, and aberration, this distance is constantly varying; and we ought, therefore, to introduce these variations into the above equation. But our object being merely to give a general view of the principles made use of for the determination of the co-efficient \( a \), we have not thought it necessary to enter so triflingly into the minutiae of the computation. It appears from the above, that the constant co-efficient \( a \) may be determined by means of four observations on two different circumpolar stars; and, consequently, that every such set of observations ought to produce the same result, or the same value of \( a \). Considering, however, the extreme accuracy required in such cases, both in the instruments and the application of them, some little disagreement is to be expected; and indeed one is surprised to see it so small, as it has been found to be in various observations undertaken for this purpose, and the mean of which we have every reason to consider as perfectly correct; and which is stated by M. Biot, who has interested himself very much on this subject, at 187.42, for the decimal division, or 60.9666 for the sexagesimal division.

But now, in order to simplify our first formula, by taking \( \rho = 0.76 \) metres, and \( \alpha = 0 \), this may be put under the form,

\[ r = a \tan Z \left(1 - \frac{0.00125354}{\cos^2 \alpha}\right) + \frac{0.5 a' \sin \tan \alpha}{\cos^2 \alpha} \]

wherein, substituting for \( \cos^2 \alpha \), its value \( \frac{1}{1 + \tan^2 \alpha} \), and the proper numerical value of \( a \), as above found, as also of \( \tan \alpha \), the whole is reduced to the following form, viz.

\[ r = 0.99918761 \cdot a \tan Z - 0.001105823 \cdot a \tan^2 Z \]

which latter form M. Biot has shown to be equivalent to

\[ r = 187.42 \cdot \tan (Z - 3.25) \]

for the decimal division;

\[ r = 60.9666 \cdot \tan (Z - 3.25) \]

for the sexagesimal division.

But the reduction of it to this form would occupy more space than can be allowed for this article. This last form is as simple as can be desired, from which the following rule in words may be deduced, viz. The refraction under the same barometric pressures, and the same degree of temperature, is proportional to the tangent of the apparent zenith distance of the star, diminished by 3.25 times the refraction.

It must be remarked, however, that the formula \( r = A \tan (Z - 3.25) \), though it exhibits the law of refraction in as simple a form as can be desired, is not well adapted for calculation, in consequence of \( r \) entering on both sides of the equation; and astronomers have, therefore, given different methods of rendering the above formula more commodious. In order to which, it is first put under the form,

\[ \tan n r = \tan n R \tan (Z - n r) \]

\( R \) representing the refraction, answering to \( Z = 90^\circ \). Let us now add successively to both sides of this equation, the quantities \( + \tan n r \tan n R - \tan n R \tan n r \), and we shall have,

\[ \tan n r (1 + \tan^2 n R) = \tan n R \left[ \tan (Z - n r) + \tan n r \right] \]

\[ \tan n r (1 - \tan^2 n R) = \tan n R \left[ \tan (Z - n r) - \tan n r \right] \]

Now, dividing these equations, member by member, \( n r \) will be eliminated, and we obtain

\[ \frac{1 + \tan^2 n R}{1 - \tan^2 n R} = \frac{\tan (Z - n r) + \tan n r}{\tan (Z - n r) - \tan n r} \]

whence we draw

\[ \tan (Z - 2 n r) = \cot 2 n R \cdot \tan Z \]

Now
REFRACTION.

Now Z and its length being known, we may compute the second side of this equation; whence the arc $Z - 2 \tan r$ is known, and consequently $2 \tan r$; which, divided by $2 n$, will give $r$, as required. But it may be found still more simply by the formula,

$$\tan r = \frac{\tan n R \tan \frac{1}{2} n}{\tan n}$$

where $n$ is the refraction at the Earth's surface, and $R$ is the refraction of the Earth's atmosphere.

On the principle above explained, the following table of refractions has been computed, agreeing with the temperature of the centigrade thermometer, and under a pressure of 0.76 metres of the barometer; which is the same as 57.2 Fahrenheit, and 29.022 English inches. And for any other temperature and pressure, the corresponding corrections must be made as indicated in Tables II. and III., where tables are computed by means of the general formula given in the preceding part of this article.

We had intended to give here a short abstract of a very interesting paper on this subject, published by Mr. Groombridge, in the Philosophical Transactions for 1810; but having already exceeded our usual limits, we can only refer the reader to the volume itself, where he will find several neat and useful formulæ.

Having thus given a sketch of the method of determining the quantity of astronomical refraction for all angles of elevation, and under various degrees of temperature and barometric pressure, let us add a few words on the subject of terrestrial or horizontal refraction; for the determination of which, the following method has been successfully practised in the English Trigonometrical Survey.

Let $A, A'$ (Plate XIX, Astronomia, fig. 11.) be two elevated places on the surface of the Earth; $B, B'$, the left or right angles of the Earth's surface; $C$, the centre of the Earth; $A H, A' H'$, the horizontal lines at $A, A'$, produced to meet the opposite vertical lines $C H, C' H$. Let $a, a'$, represent the apparent positions of the objects $A, A'$; then is $a A A'$ the refraction observed at $A$, and $a A' A$ the refraction observed at $A'$; and half the sum of these angles will be the horizontal refraction, if we assume it equal at each station.

Now an instrument being placed at each of these stations $A, A'$, the reciprocal observations are made at the same instant of time, which is determined by means of signals or watches previously regulated for that purpose; that is, the observer at $A$ takes the apparent depression of $A'$, at the same moment that the other observer takes the apparent depression of $A$. Then, in the quadrilateral $A C A' B$, the two angles $A, A'$, are right angles, and consequently the angles $A$ and $A'$ are together equal to two right angles; but the three angles of the triangle $A A' C$, are together equal to two right angles; and consequently the angles $A$ and $A'$ are together equal to the angle $C$, which is measured by the arc $B D$. If, therefore, the sum of the two depressions $H A a, H' A a$, be taken from the sum of the angles $H A' A$, and $H' A' A$, or, which is equivalent, from the angle $C$, (which is known, because its measure $B D$ is known,) the remainder is the sum of the two refractions. Hence this rule, “Take the sum of the two depressions from the measure of the intercepted terrestrial arc, and the remainder is the refraction.” If, by reason of the minute errors of the contained arc $B D$, one of the objects, instead of being depressed below the tangent $A H'$, appears elevated, as supposes $A$ to $a'$, then the sum of the angles $a A A'$, and $a A' A$, will be greater than the sum $I A A' + I A' A$, or than $C$, by the angle of elevation $a A A'$; but if from the former sum there be taken the depression $H A A'$, there will remain the sum of the two refractions, so that in this case the rule becomes as follows: “Take the depression from the sum of the contained arc and elevation, and half the remainder is the refraction.”

The quantity of this terrestrial refraction is estimated by Dr. Maltecky at one-tenth of the distance of the object observed, expressed in degrees of a great circle. Where the distance be 10,000 fathoms, its 10th part, 1000 fathoms, is the 65th part of a degree, or one minute, which, therefore, is the refraction in altitude of the object at that distance. But Le Gendre is induced, by several experiments, to allow only one-fourteenth part of the distance for the refraction in the altitude, so that on the distance of 10,000 fathoms, the 14th part of which is 714 fathoms, he allows only 44" of terrestrial refraction, so many being contained in 714 fathoms. (See his Memoir on the Trigonometrical Operations.) Again, Delambre makes the quantity of terrestrial refraction to be one-twelfth part of the arc of distance. And the English measurers, from many very exact observations, determine the quantity of the medium refraction to be a twelfth part of the said distance. The mean of all these is about $0.8\%$ of the intercepted arc, which is probably not very far from the truth; this quantity, however, it must be observed, is found to vary very considerably with the different latitudes of the weather and atmosphere, from one-seventh to one-eighth of the contained arc.

Table
TABLE I. Of Refraction.

Barometer 29.922 Inches = 0.76 Metre; Thermometer Centigrade, 14°; Fahrenheit's, 57°.2; Reaumur's, 11°.2.

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<th>Refraction of the flars</th>
<th>Differences</th>
<th>Apparent altitude</th>
<th>Refrac. minus parallax of the &amp;</th>
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### Table II. Of Corrections to the preceding Table of Refractions for different Degrees of Temperature. An Increase of Cold augments Refraction; therefore, the Correction is Additive for a Temperature less than 14° of the Centigrade, and Subtractive for those above it.

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### Table III. Of Corrections to the Table of Refractions relative to the Weight of the Atmosphere. An Increase of Atmospheric Pressure augments Refraction; the Correction is Additive when the Barometer is more than 29.923 Inches, but Subtractive when less.

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<tr>
<th>Apparent Altitude</th>
<th>Correlation Additive.</th>
<th>Correlation Subtractive.</th>
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To
To observe the Refraction of a Star, &c. 1. Observe the meridian altitude of a star near the zenith; whence the latitude of the place being known, the true declination of the star is easily had, the star being now void of any sensible refraction. 2. Observe the altitude of the same star in any other degree, and note the time by a pendulum. 3. For the given time of observation, from the declination of the star compute its true altitude.

This being thus found less than the altitude observed, subtract the one from the other; and the remainder is the refraction for that moment, in that degree.

Refraction of Altitude, is an arc of a vertical circle, by which the altitude of a star is increased by the refraction.

Refraction of Declination, is an arc of a circle of declination, by which the declination of a star is increased or diminished by the refraction.

Refraction of Ascension and Declension, is an arc of the equator, by which the ascension and declension of a star, whether right or oblique, is increased or diminished by means of the refraction.

Refraction of Longitude, is an arc of the ecliptic, by which the longitude of a star is increased or diminished by means of the refraction.

Refraction of Latitude, is an arc of a circle of latitude, by which the latitude of a star is increased or diminished by means of refraction.

Refraction, in Commerce, is a term sometimes used by merchants, where there has been an oversight in an account, to the prejudice of a person; who thereupon demands restitution of so much, added or omitted by mistake.

You must make me a refraction of five pounds forgot in your account. I will deduct or make you a refraction of 30s. charged inadvertently in my bill.

REFRACTORY, in Chemistry. See an explanation of the term under APYRIOUS.

REFRAIN, Fr., in Musique, the termination of every verse or stanza of a song, by the same words and the same melody. (See BURDEN.) The word, according to Menage (Dict. Etym.) is derived from the Spaniel refrain.

REFRAN, Span., a proverb; the burden of a song in that language, being usually sententious, and including some moral precept.

REFRANGIBLE, whatever is capable of being refracted. See REFRACTIBILITY.

REFRACTIBILITY of Light, the disposition of the rays to be refracted.

A greater or less refrangibility is a disposition to be more or less refracted, in passing at equal angles of incidence, into the same medium.

That the rays of light are differently refrangible, is the foundation of Sir Isaac Newton's whole theory of light and colours. The truth of the principle, which was inveighed against and established by our great philosopher in the year 1666, will appear from the following experiments.

1. Let EG (Plate XIX. Optics, fig. 1.) represent the window-shutter of a dark room, and F a hole in it, through which the light is transmitted to the prifm ABC, which refracts it towards PT, where it appears in an oblong form; its length being about five times greater than its breadth, and exhibiting the various colours of the rainbow. In fig. 2, ag b represents a second prifm, which refracts the light back again to Q, where the image is round; whereas, without the interposition of this second prifm, the light would have proceeded to PT; and, consequently, been oblong, as before. In this experiment Sir Isaac Newton took care that the plane ag was placed exactly parallel to BC, and also bg to AC, that the rays might be equally refracted, though in contrary ways, by both prifs. He also observed, that both prifs must be placed very near to one another; for if their distance be so great, that colours begin to appear in the light, before its incidence on the second prifm, those colours will not be destroyed by the refraction of that prifm.

2. Having placed one of two boards behind the prifm at the window, so that the light might pass through a small hole made in it for the purpose, and fall on the other board at the distance of about twelve feet, a hole being made in it to admit the passage of the incident light, he then placed another prifm behind the second board, so that the light which was transmitted through both the boards might pass through that also, and be again refracted before it arrived at the wall. This being done, he took the first prifm in his hand, and turned it about its axis so much, as to make the several parts of the image, cast on the second board, successively to pass through the hole in it, that he might observe to what places on the wall the second prifm would refract them; and he saw, by the change of those places, that the light tending to that end of the image, towards which the refraction of the first prifm was made, did, in the second prifm, suffer a refraction considerably greater than the light which tended to the other end. The true cause, therefore, of the length of that image was discovered to be no other, than that light is not similar or homogeneal, but that it consists of rays, some of which are more refrangible than others; so that without any difference in their incidence on the same medium, some of them shall be more refracted than others; and therefore, that according to their particular degrees of refrangibility, they will be transmitted through the prifm to different parts of the opposite wall.

To make this capital experiment, which Sir Isaac Newton himself justly calls the experimentum crucis, let SF (fig. 3.) represent a ray of the sun, which, after passing through a hole in the window-shutter F, is received by the prifm in ABC, close behind which is placed a board D E, with a hole in it at G, to admit any of the rays after they have been separated by the prifm; then de will represent the other board, placed at a considerable distance from the former, with a hole in it, g, to receive any part of the light transmitted through the other board. Behind this second board is placed another prifm, a bc, through which different rays of light, falling upon it in the very same place, and with precisely the same angle of incidence, will be refracted higher or lower, on the opposite wall MN. This experiment was conducted with the utmost circumspection and accuracy; and it is observed, that neither the different magnitude of the hole in the window-shutter, nor the different thicknesses of the prifm, at the place where the rays passed through it, nor the different inclinations of the prifm to the horizon, nor the different matter of the prifms, made any sensible change in the length of the image.

3. In order farther to establish this famous hypothesis of the different refrangibility of the rays of light, he held a prifm in a beam of the sun, which was transmitted into the room through a hole in the window-shutter, so that its axis might be perpendicular to that beam; and having turned the prifm about its axis to make the image ascend and descend, and when it seemed to be stationary between these contrary motions, he fixed the prifm so that the refractions of both sides might be equal to each other. In this situation he looked at the hole through the prifm, and observed the length of its refracted image to be many times greater than its breadth: the most refracted part of it was violet, the least refracted red, the middle parts blue, green, and yellow, in order. The same thing happened when he removed the prifm.
out of the sun’s light, and looked through it upon the hole
shining by the light of the clouds beyond it.

4. Considering that if the image of the sun should be
drawn into an oblong form, either by a dilatation of every ray,
or by any other casual inequality of the refractions, the fame
oblong image would, by a second refraction, made sideways,
be drawn out as much in breadth, he placed a second prism
immediately after the first, in an oblique position with regard
to it, that it might again refract the light of the beam of
the sun’s light, which came to it through the first prism; so that
in the first prism, the beam would be refracted upwards, and
in the second sideways. But he found that the breadth of
the image was not increased by the refraction of the second
prism, but only its upper part, which in the first prism suf-
fcred the greatest refraction, and appeared violet and blue,
did again, in the second prism, suffer a greater refraction,
than the lower part of it, which was red and yellow, and
this without any dilatation of the breadth of the image.
Thus let S (fig. 4.) represent the fun, F the hole in the
window, A B C the first prism, and D H the sec-
cond. If Y represent the round image of the sun, made
by a direct beam of light, when the prisms are taken
away, P T will be the oblong image of the sun, made
by the same beam passing through the first prism only, and
P I will be the image made by the crofs refractions of both
prisms together. Sometimes he placed a third prism after
the second, and sometimes a fourth after the third; by
all which the image might be often refraffed sideways, but
the rays which were more refracted than the reit in the first
prism, were also more refracted in all the others, and that
without any dilatation of the image sideways; and, there-
fore, these rays, on account of their confluence of a greater
refraction, he called the more refrangible ones. He obser-
ves, in order to render the meaning of this experiment more evi-
dent, that all the rays, which are equally refrangible, fall
upon a circle answering to the sun’s di
c. Let, therefore,
A G (fig. 5.) represent the circle which all the most refran-
gible rays, transmitted from the whole disc of the sun, would
illuminate, and paint upon the opposite wall, if they were
alone. Let E I be the circle which all the least refrangible
rays would, in like manner, illuminate, and paint, if they
were alone, and let B H, C J, and D K, be the circles
which so many intermediate kinds of rays would successively
paint upon the wall, if they were singly propagated from the
fun, the reit being always intercepted, and conceive that
there are other intermediate circles without number, which
other innumerable intermediate kinds of rays would success-
ively paint upon the wall, if the sun should successively
emit every kind by itself. Now since the sun emits rays of
all these kinds at once, they must altogether illuminate and
paint innumerable equal circles, of all which, being ranged
according to their different degrees of refrangibility, the
oblong image P T before described is composed.

Now if the sun’s circular image, Y, which is made by an
unrefracted beam of light, was by any dilatation of the sin-
gle rays, or by any other irregularity in the refraction of the
first prism, converted into the oblong image P T, then
ought every circle in the image to be in like manner drawn
out into a similar oblong figure, contrary to the refult of
this experiment.

He considered further, that by the breadth of the hole
through which the light enters into the dark chamber, there
is a penumbra made in the circumference of the image Y,
which is also visible at the sides of the oblong images P T
and P I. He, therefore, placed at that hole a lens, or ob-
ject-glafs of a telescope, which might call the image of the
sun distinctly on Y, without any penumbra at all; and he
found that the penumbra of the reftilinear sides of the ob-
long images P T and P I was also thereby taken away, so
that they were as distinctly defined as the circumference of
the first image Y.

There are some other circumstances attending this experi-
ment, by which the conclusion drawn from it is made still
more plain and convincing.

Let the second prism, D H, (fig. 6.) be placed not im-
immediately after the first, but at some distance from it, so
that the light from the first prism may fall upon it in the
form of an oblong spectrum q r, parallel to this second
prism, and may be refracted sideways, to form the oblong
image, p t, upon the wall, and it will be found that this
image, p t, is inclined to the image P T, which the first
prism would have formed without the second; the blue
ends, P and p, being farther distant from one another than
the red ones, T and t; and, consequently, the rays which
go to the blue end, q, of the image q r, and which, there-
fore, suffer the greatest refraction in the first prism, are
again, in the second prism, more refracted than the reit.

At two holes made near another in his window-
flutter, he placed two prisms, one at each, which might
cait upon the opposite wall two oblong coloured images of
the sun; and at a little distance from the wall he placed a
long linder paper, with straight and parallel edges; and he
placed the prisms and paper, so that the red colour of one
image, at T, (fig. 7.) might fall directly upon one half of
the paper, and the violet colour, M, of the other image,
upon the other half of the same paper. Then with a black
cloth he covered the wall behind the paper, that no light
might be reflected from it to disturb the experiment; and
viewing the paper through a third prism, held parallel to it,
he saw that half of it which was illuminated by the violet
light to be divided from the other half, by a greater refra-
cction, especially when he retired to a considerable distance
from the paper.

He farther caused the two images, P T and M N (fig. 8.)
to coincide, in an inverted order of their colours, the red
end of each falling on the violet end of the other; and then
viewing them through a prism D H, held parallel to their
length, they no longer appeared coincident, as when they
were viewed with the naked eye, but in the form of two
different images, p t and m n, crossing another one
in the middle; which shews that the red of the one image, and
the violet of the other, which were coincident at P N and M T,
being parted from one another by a greater refraction of the
violet to p m, than that of the red to n and t, differ in de-
gree of refrangibility.

Having placed a prism, whose two angles at its base were
equal to one another, and half right ones, and the third a
right one, in a beam of the sun’s light, admitted into the
room as before, he turned it slowly about its axis, till all
the light which went through one of its angles, and was
refraffed by it, began to be reflected by its base, (at which
moment, till then, it went out of the glafs,) and then he observed
that those rays which had suffered the greatest refraction
were sooner reflected than the reit. He imagined, therefore,
that those rays of the reflected light, which were most re-
frangible, did first of all, by a total reflection, become more
copious in that light than the red; and that afterwards the
red, also, by a total reflection, became as copious as those.
To try this, he made the reflected light pass through another
prism, and, being reflected by it, to fall afterwards upon
sheet of white paper, at some distance behind it, and there
to paint the usual colours of the prism. Then causing the
first prism to be turned about its axis, he observed, that
when those rays which, in this prism, had suffered the
greatest
greatest refraction, and were of a blue and violet colour, began to be wholly reflected, the blue and violet light on the paper, which received the rays from the second prism, was sensibly increased, above that of the red and yellow, which was least refracted; and afterwards, when the rest of the light, which was green, yellow, and red, began to be wholly reflected in the first prism, the light of those colours on the paper received as great an increase as the violet and blue had done before. From this it is manifest, that the beam reflected by the base of the prism, being augmented first by the more refrangible rays, and afterwards by the less refrangible ones, is compounded of rays differently refrangible. This experiment is illustrated by fig. 9, in which $A B C$ represents the first prism, on the base of which the light falls, at $M$. When this prism is turned about its axis, according to the order of the letters $A B C$, the more refrangible rays, $M H$, emerge more and more obliquely; and at length, after their molli oblique emergence, are reflected towards $N$, and going on to $P$, increase the number of rays $N P$. By continuing the motion of the first prism, the less refrangible rays, $M G$, are reflected to $N$, and increase the number of rays $N A$.

Since it appears from Sir Isaac Newton’s experiments, that different rays of light have different degrees of refrangibility, it necessarily follows that the rules laid down by preceding philosophers, concerning the refractive power of water, glas, &c. must be limited to the middle kind of rays, as it may be supposed that Kepler, Snellius, and others would attend to them principally. Sir Isaac, however, proves that the fine the incidence of every kind of light, considered apart, is to its fine of refraction in a given ratio. This he deduces both by experiment, and also geometrically, from the supposition that bodies reflect the light by acting upon its rays in lines perpendicular to their surfaces.

Upon the whole it appears, that the blue rays are more refracted than the red ones, and that there is, likewise, unequal refraction in the intermediate rays; and upon the whole it appears, that the sun’s rays have not all the same refrangibility, and, consequently, are not of the same nature. It is also observed, that those rays which are most refrangible are also most reflexible. See the proof of this under Refrangibility. Newton’s Optics, p. 22, &c. ed. 3.

The difference between refrangibility and reflexibleness was first discovered by Sir Isaac Newton, in 1671-2, and communicated in a letter to the Royal Society, dated February 6, 1671-2, and published in the Philosophical Transactions, N° 86, p. 3075; and from that time vindicated by him from the objections of several authors; particularly F. Pardies, M. Mariotte, Fr. Linus, or Lin, and other gentlemen at the English college at Liege; and at length it was more fully laid down, illustrated, and confirmed, by a great variety of experiments, in his excellent treatise of Optics.

But farther, as not only those colours of light produced by refraction in a prism, but also those reflected from opaque bodies, have their different degrees of refrangibility and reflexibleness; and as a white light arises from a mixture of the several coloured rays, the same great author concluded all homogeneous light to have its proper colour, corresponding to its degree of refrangibility, and not capable of being changed by any reflections, or any refractions; that the sun’s light is composed of all the primary colours; and that all compound colours arise from a mixture of the primary ones, &c.

The different degrees of refrangibility he conjectures to arise from the different magnitude of the particles of which the different rays confit. Thus the most refrangible rays, i.e. the red ones, he supposes to consist of the largest particles; the least refrangible, i.e. the violet rays, of the smallest particles; and the intermediate rays, yellow, green, and blue, of particles of intermediate sizes.

Having given a general view of the Newtonian theory of colours, as they depend upon the refraction of light, under the article Colour, we shall here add some farther particulars on this subject. From a review of that article, and of what has been above delivered, we may infer that, as the rays of light differ in refrangibility, they also differ in their disposition to exhibit this or that particular colour; so that colours are not modifications of light, derived from refractions or reflections of natural bodies, but original and separate properties, which are different in different rays. Moreover, to the same degree of refrangibility always belongs the same colour, and to the same colour the same degree of refrangibility; nor are the same species of colour, and degree of refrangibility, that are proper to any particular kind of rays, subject to change by refraction and by reflection of natural bodies, nor by any other cause which for Sir Isaac Newton could be observed. Although a seeming transmutation of colours may be produced by a mixture of different kinds of rays, yet, in such mixtures, the component colours themselves do not appear; but, by their mutually allying each other, constitute a middle colour; and, therefore, if, by refraction, the different rays be separated, colours will emerge different from that of the composition. Thus blue and yellow powders, finely mixed, appear green to the naked eye; and yet the colours of the component particles are not thereby really changed, but only blended; for when they are viewed with a microscope, they still appear blue and yellow. It appears that there are also two sorts of colours: the one original and simple; the other compounded of these. The original and primary colours are red, orange, yellow, green, blue, indigo, and a violet purple, and an indefinite variety of intermediate gradations. The same colours in specie with those primary ones may be also produced by a composition; thus a mixture of yellow and blue makes green; of red and yellow, orange; and of orange and yellowish-green, yellow. In general, if any two colours are mixed, which, in the series of those that are produced by the prism, are not too far distant from one another, they, by their mutual alloy, compose that colour which appears in the midway between them; but those which are situated at too great distance have not this effect: e. g. orange and indigo do not produce the intermediate green, nor scarlet and green the intermediate yellow.

The most wondrous composition is that of whitening, which no one sort of rays alone can exhibit, but which is always compounded; so that all the aforesaid primary colours, mixed in a certain proportion, are necessary to form it. See Colour.

Having shewn, in the preceding part of this article, the extremes of the different degrees of refrangibility in the different kinds of light, we shall now proceed to give the result of Newton’s investigation, concerning the different degrees of refrangibility of all the different kinds of light, according to their several colours; particularizing this part of the subject with an explanation of the method which he made use of to define the boundaries of each colour, in the oblong image of the fun above described. In that image, though there was a manifest difference of colour, not only between the two extremes, but also in the intermediate parts, yet the exact place at which any one colour ended, and another began, was far from being sufficiently distinguishable.
guishable. The reason of this indistinctness is, that rays of every kind coming from all parts of the sun’s disk, an entire image of the sun is projected on the paper, consisting of a circle of each particular colour; and as the rays differ in kind by infinitesimal degrees, from the extreme red to the extreme violet, there must, in fact, be thousands of these circles in the same oblong image, the centres of which are infinitely near to one another; so that the light is intimately mixed, especially in the middle of the image, where it is the brightest.

If these circles, as he observes, whilst their centres keep their dilations and positions, could be made lenses in diameter, their interfering one with another, and consequently the mixture of heterogeneous rays, would be proportionately diminished. Thus, in PT (fig. 10.) the circles of which the solar image consists, expand into one another; but in the same figure, pt, being composed of two circles, but having their centres at the same distance as the former, do not extend into one another, the mixture being diminished in proportion to the diameters of the circles.

Now these circles would be diminished, if, without the room, at a great distance from the prism, towards the sun, some opaque body was placed, having a round hole in the middle of it, to intercept all the sun’s light, except so much as, coming from the middle of its disk, could pass through that hole to the prism; for so the separate circles would no longer answer to the whole disk of the sun, but only to that part of it which can be seen from the prism, through that hole. But that these circles may answer more distinctly to the hole, a lens is to be placed by the prism, to cast the image of the hole, that is, of each separate circle, distinctly upon the paper; and if this be done, it will not be necessary to place that hole very far off, not even beyond the window. Instead, therefore, of that hole, he made use of the hole in his window-shutter, in the following manner.

At about 10 or 12 feet from the window, he placed a lens, by which the image of the hole might be distinctly cast upon a sheet of white paper, at the distance of 6, 8, 10, or 12 feet from the lens. Then, immediately after the lens, he placed a prism, by which the reflected light might be thrown upwards, or sideways; and he moved the paper that received it, either towards the prism, or from it, till he found the exact distance at which the sides of the image appeared most distinct. By this means the circular images of the hole were terminated most distinctly, without any penumbra, and therefore extended into one another the least that they could; and consequently the mixture of the heterogeneous rays was the least of all. And by using a greater or lesser hole in the window-shutter, he made the circular images greater or less at pleasure, and thereby the mixture of rays in the oblong image was as much or as little as he chose. He sometimes made the breadth of the image 45 times, and sometimes 60 or 70 times less than its length. In this manner, he says, light is made sufficiently simple, and homogeneal, for trying any of his experiments about simple light; for that the heterogeneous rays in this light are so few, as hardly to be perceived, excepting, perhaps, in the indigo and violet, which, being dark colours, do easily suffer a sensible alloy by that little scattering light, which used to be refracted irregularly by the inequalities of the prism. The whole process of this experiment is so evident, by inspection of fig. 11, that it needs no particular illustration.

Instead of a circular hole, our author recommends a hole shaped like a long parallelogram, with its length parallel to the prism. For if this hole be an inch or two long, and but a tenth or twentieth part of an inch broad, or narrower, the light of the image will be as simple as before, or more simple, and the image will become much broader, and therefore much more fit for these experiments.

Or, instead of this hole, another may be formed of a triangle of equal sides, whose base may be about the 10th part of an inch, and its height an inch or more. For, by this means, if the basis of the prism be parallel to the perpendicular of the triangle, the image of it (fig. 12.) will now be formed of equicrural triangles, ag, bh, ei, dl, el, fm, &c. and innumerable other intermediate ones, answering to the triangular hole in shape and bigness, and lying one another in a continual series, between two parallel lines, af, gm.

These triangles are a little intermingled at their bases, but not at their vertices; and therefore the light on the brighter side, af, of the image, where the bases of the triangles are, is a little compounded, but on the darker side, gm, it is altogether uncompounded; and in all places between the sides, the composition is proportionable to the diliances of the places from that obfcurer side gm; and having an image of such a composition, we may try experiments either in its stronger and less simple light, near the side af; or in its weaker and more simple light, near the other side gm, as shall seem most convenient.

In making these experiments, he advises, that the chamber be made very dark, that the lens be very good, being made of glass free from bubbles and veins, the sides of the prism truly plane, and its polished, with an angle of about 65 or 70 degrees; and the edges of the prism and lens, as far as they make any irregular refraction, should be covered with black paper glued on them. He also observes, however, that all the useless light should be intercepted with black paper, or other black obstacles. It being difficult to get glasses prisms fit for these nice experiments, he sometimes used prismatic veils made with pieces of broken looking-glasses, and filled with rain-water; and to increase the refraction, he sometimes strongly impregnated the water with the gas deutus saturni. When he had, by this means, got the sides of the coloured image, as AT, GM, (fig. 13.) distinctly defined, he delineated on paper the outlines of it, FAPGM, T, and held the paper so that the image might fall on this figure, and coincide with it exactly; whilst an attendant, whose eyes could distinguish colours better than his own, did, by right lines drawn cross the image, mark the confines of each colour; and this operation being frequently repeated, both on the same and on different papers, he found that the observations agreed well enough with one another, and that the sides, MG and FA, were by these means divided like a musical chord; so that if GM were produced to X, making MX equal to GM, and if GX, IA, IB, BX, EX, GX, a, MX, were in proportion to one another, as the numbers 1, 2, 3, 4, 5, 6, 7, and 8, and so represented the chords of the key, and of a tone, a third minor, a fourth, a fifth, a sixth major, a seventh, and an eighth above that key. And the intervals MA, ag, ge, eb, bi, f, and /, were the spaces which the several colours, red, orange, yellow, green, blue, indigo, and violet, took up.

Now these intervals or spaces, subtending the differences of the refractions of the rays, going to the limit of these colours, that is to the points M, a, g, e, b, i, l, G, may, without any sensible error, be accounted proportionate to the differences of the lines of refraction of those rays, having one common line of incidence; and, therefore, since the common line of incidence of the most and least refrangible rays, out of glass into air, was found in proportion to their refractions as 50 to 77 and 78; if the difference between
tween 77 and 78 be divided, as the line GM is divided by
those intervals, there will be $77, 77^1, 77^2, 77^3, 77^4, 77^5, 77^6, 77^7, 78$, for the lines of refraction of those rays out of
glas into air, their common fine of incidence being 50. So
then the lines of the incidences of all the red-making rays
out of glass into air were to the lines of their refractions not
greater than 50 to 77, nor less than 50 to 77; but they varied
from one another according to all their intermediate
proportions, and of all the other colours.

Having demonstrated that the light of the sun consists of
certain proportion of differently coloured light, our author
proves, by another series of experiments, what has been al-
dready demonstrated by a single one mentioned above, that
when a beam of light has been divided into its component
parts, if they be again mixed, they will produce white; or
if any one of them be intercepted, the image will appear
muted, and in a different manner, according to the different
colours that are thereby prevented from mixing with the
red; and to complete the whole, he observes, that inter-
cepting all the colours that compose the white image except
one, and thereby making to exhibit the appearance of all
the other colours in order; yet, if he made this succession of
all the colours very quick, the appearance was always white,
though it was demonstrable that only one colour took place
at any one time; and he judiciously observes, that if each of these
colours in succession give the idea of whiteneß, much more
will they produce that effect, when they are so intimately
mixed as they are in a natural sun-beam.

Not content with composing whiteneß from the sepa-
ately coloured rays of the sun, he attempted, and succeeded
in his attempt, to do the same with natural coloured bodies,
oberving the same proportions of the respective colours
that he had found in the solar image. The coloured pow-
ders which he made use of at first produced only a kind of
grey; but this was in fact a dull white, or whiteneß mixed
with shade; for when he contrived to throw a very strong
light upon it, it became intensely white, so that a friend of
his, who happened to call upon him while he was busy
about these curious experiments, and who knew nothing of
what he had been doing, pronounced that the powders he
had been mixing, when thus illuminated, made a better
white than some very fine white paper, with which he was
comparing it.

As the preceding proportion of all the prismatic colours
makes a white, it is evident that when they are mixed in
different proportions, or when only a few of them are used,
they will make different colours; and our philosopher has
given us the following ingenious method of knowing, in a
mixture of primary colours, the quantity and quality of each
being given, the colour of the compound. With the centre
O, (fig. 14.) and the radius OD, describe a circle ADF,
and divide the circumference into seven parts, proportional
to the seven musical tones or intervals contained in an oc-
tave, that is in proportion to the numbers $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{7}{8}, \frac{1}{5}, \frac{7}{10}, \frac{7}{12}$. Let the first, DE, represent a red colour, the
second, EF, orange, and so of the red; and let all these
colours be supposèd to pass gradually into one another.
Let $p$ be the centre of gravity of the arc DE, and $r, s, t, u, v, w$ be the centres of gravity of the other arcs; and
about those centres let circles, proportional to the number of
rays of each colour in the given mixture, be described.
Then find a common centre of gravity of all those circles;
and if a line be drawn from the centre of the circle O,
through this point, as suppose at $z$, the point $Y$, in which
it terminates at the circumference, will shew the colour that
arises from the mixture; and the line OZ will be propor-
tioned to the fullness or intenseness of the colour, the centre
O representing perfect white. But if only two of the pri-
mary colours, which in this circle are opposite to one
another, be mixed in an equal proportion, the point Z will
fall upon the centre O, and yet the colour compounded of
those two will not be perfectly white; but some faint anony-
mous colour; so he could never, by mixing only two pri-
mary colours, produce a perfect white. Whether it might
be the result of three taken at equal distances in the circum-
ference he could not tell; but he did not much question,
but that four or five of them would be sufficient. These,
however, as he observes, are curiosities of little or no mo-
moment to the understanding of the phenomena of nature,
since, in all natural whites, there is a mixture of all kinds
of rays. Newton’s Optics. Prieëly’s Hist. of Light and
Colours.

For the method of correcting the effect of the differ-
ent refraction of the rays of light in glasses, see Aberra-
tion and Telescope; see also Dispersion of Light.

Radiant heat, as well as light, is not only refractionable,
but it is also subject to the laws of dispersion, arising from
its different refraction. The prism refractions radiant heat,
as so as to separate that which is less efficacious from that which is
greater. The whole quantity of radiant heat contained
in a sun-beam, if this different refraction did not exist,
must inevitably fall uniformly on a space equal to the area of
the prism, and if radiant heat were not refractionable at all, it
would fall upon an equal space, in the place where the
shadow of the prism, when covered, may be seen. But
neither of these events taking place, it is evident that the
radiant heat is subject to the laws of refraction, and also to
those of the different refraction of light. Whence Dr.
Herchel is led to surmise, that radiant heat consists of
particles of light of a certain range of moments, which
range may extend a little farther, on each side of refrangi-
bility, than that of light. (See Rays of Heat.) Dr. Her-
chel having found that two degrees of heat were obtained
from that part of the prismatic spectrum which contained
the violet rays, while the full red colour, on the opposite side,
gave no less than seven degrees, infers from these facts the
different refraction of the rays which occasion heat, as
clearly and certainly as it is concluded that the refraction
of light is ascertained by the dispersion and variety of
the colours. But he proceeds farther, and observes, that the
rays of heat are of a much more extensive refraction than
those of light. In order to make this appear, he delin-
ates a spectrum of light, by assuming a line of a certain
length; and, dividing it into seven parts, according to the
dimensions asigned to the seven colours by Sir Isaac Newton,
in the fourth figure of the second part of his Optics,
represents the illuminating power of which each colour
is possessed, by an ordinate drawn to that line. And here,
as the absolute length of the ordinates is arbitrary, provided
they be proportional to each other, he assumes the length
of that which is to express the maximum, equal to $\frac{7}{4}$ of
the whole line.

Thus, let GQ (fig. 15.) represent the line that contains the
arrangement of the colours, from the red to the violet.
Then, erecting on the confines of the yellow and green the line
L R = $\frac{4}{3}$ of GQ, it will represent the power of illumina-
tion of the rays in that place. For, by experiments al-
dready delivered, we have shewn that the maximum of illumina-
tion is in the brightest yellow or palest green rays. From
the same experiments we collect, that the illuminations of
yellow and green are equal to each other, and not much in-
ferior to the maximum; this gives us the ordinates K and M.
Then, by the rest of the same experiments, we obtain also
the
the ordinates $H$, $I$, $N$, $O$, $P$, with sufficient accuracy for the purpose here intended. All these being applied to the middle of the spaces which belong to the respective colours, we have the figure $G$, $R$, $Q$, $G$; representing what may be called the spectrum of illumination.

We are now, in the same manner, to find a figure to express the heating power of the refracted prismatic rays, or what may be called the spectrum of heat. In order to determine the length of the base, Dr. Herchel examined the extent of the invisible rays, and found, that at a distance of two inches beyond visible red, his thermometer, in a few minutes, acquired 1/4 degree of heat. The extent of the coloured spectrum at that time, or the line which answered to $G$ in his figure, measured 2,997 inches. If two inches had been the whole of the extent of the invisible part, it might be stated to be in proportion to the visible one as 2 to 3; but we are to make some allowance for a small space required beyond the last ordinate, that the curve of the heating power drawn through it may reach the base; and indeed, at 2.5 inches beyond visible red, Dr. Herchel could still find 1/4 degree of heat. It appears therefore sufficiently safe, to admit the base of the spectrum of heat $A$, to be so to that of the spectrum of light $G$, as 5:4 to 3; or, conforming to the Newtonian figure before mentioned, the base of which is 3.3 inches, as 575:33. Now, if we assume for the maximum of heat, an ordinate of an equal length with that which was fixed upon for the maximum of light, it will give us a method of comparing the two spectra together. Accordingly, Dr. Herchel has drawn the several ordinates $B$, $C$, $D$, $E$, $F$, $G$, $H$, $I$, $K$, $L$, $M$, $N$, $O$, $P$, of such lengths as, from experiments made on purpose, it appeared they should be, in order to express the heat indicated by the thermometer, when placed on the base, at the several positions pointed out by the letters.

A mere inspection of the two figures, which have been drawn as lying upon one another, will enable us now to see how very differently the prism disperses the heat-making rays, and those which occasion illumination, over the areas $A$, $S$, $Q$, $A$, of our two spectra! These rays neither agree in their mean refrangibility, nor in the situation of their maxima. At $R$, where we have most light, there is but little heat; and at $S$, where we have most heat, we find no light at all!

**REFRESHMENT, Quarters of.** See Quarters.

**REFRET, Fr.** The burden of a song. This word is only to be found in the second folio edition of Bailey's Dictionary, 1736. In no French dictionary is there authority for it. Cotgrave, Dict. du Vieux Langage; Trevoux, Dict. de l'Académie; and Glossaries, have been consulted in vain.

**REFRIGERANT, Refrigerative, in Medicine, or cooling, from frigus, cold, an appellation given to such remedies as were supposed to possess a power of cooling the internal parts. Hence all diuretics, such as petina, gruel, and other thin drinks, vegetable and mineral acids, neutral salts, and other substances, which are debase in stimulating qualities, and communicate a fomentation of coolness to the tongue and throat, have been considered as refrigerant. As they have no actual power of generating cold in the animal body, the term is somewhat incorrect; but as it expresses the opposite quality to that of stimulating, which is used also for a:nthimous with burning, it is still retained, and applied to drink, drink, and medicine of a non-stimulant quality. In this sense, the term is nearly synonymous with sedative.

Whatever, in fact, increases the circulation, increases the heat of the body, and vice versa; potentially, therefore, all sedative medicines may be said to be refrigerant. The use of refrigerants will thence be inferred to be proper in all those cases in which there is an over-excitation of the circulation, either locally or generally, as such local inflammations, febrile diseases, hemorrhages, and the like. In the case of external inflammations, indeed, actual refrigeration may be produced, by the application of cold substances, water or ice, or by the abstraction of heat by means of evaporation; both of which afford the means of directly diminishing the activity of the vessels of the part. Thus, in burns and scalds, the pain is instantly relieved, and the inflammation effectually reduced, by the immersion of the part in cold water, if sufficiently perfused in. But in respect to internal refrigerants, their operation is of a negative kind, and consists rather in the removal of uneasy sensations, and in the exclusion of stimulant substances, than in the actual suppression of increased action. See Sedative.

**REFRIGERATION, Refrigeratorium, in Chemistry, a copper vessel filled with cold water, folded round the capital of an alembic, to cool and condense the vapours raffled thither by the fire, and to convert them into a liquor, to be discharged thence by the beak. See ALEMBIC.

The lettering in the refrigerator is to be changed from time to time, as it begins to grow warm.

Sometimes they content themselves with wrapping a wet cloth about the head of the alembic, instead of a refrigerator; but the more usual method now is, to supply the place of the refrigerator by a worm, or spiral pipe, running through a tub of cold water.

Distillation chiefly consists in evaporation and refrigeration. See Distillation.

**REFUGE, Refugium, in our Old Customs, a sanctuary, or asylum; which see respectively.**

At Paris there is an hospital called the Refuge, in which dissolute women are shut up.

**REFUGE, Cities of, in Scripture History, fix cities selected from the 48 appropriated to the residence of the Levites, which were appointed for the protection of persons from the rigour of the law, who were defpicable or involuntary homicide. Some have supposed that all the cities of the Levites were safe; but it appears from Num. xxxvi. 6, that only six of them were appointed to this use. These may were intended not only for Jews, but for Gentiles, or for thrangers who dwelt among them. (Num. xxxvi. 15.) They were not designed as sanitis for willful murderers and all sorts of atrocious villains among the Jews, as they were among the Greeks and Romans, and as such places have since been in Roman Catholic countries, but merely for securing those who had been guilty of involuntary homicide (Deut. xix. 4—10) from the effects of private revenge, until they were cleared by a legal process. It is observable, that the Israelites are commanded to "prepare the way" that is, to make the road good, "that every flour may flee thither," without impediment, and with all expedition. (Deut. xix. 3.) By having good roads to them, at least 32 cubits, or about 48 feet in breadth, and bridges wherever
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wherever they were necessary, these cities were to be easy of access; and at crofs roads pofts were erected with inscriptions, directing the way to the "city of refuge." Upon this Hottinger remarks, that it was probably in allusion to this custom, that John the Baptist is described as "the voice of one crying in the wilderness, prepare ye the way of the Lord, make his paths straight." (Luke, iii. 4—6.) He was the Mediah's forerunner, and in that character was to remove the obstacles to men's flying to him as their asylum, and obtaining salvation, the salvation of God. Every year, on the 15th of Adar, (February,) the magistrates were to inspect the roads, and ascertain their good condition. These cities were to be supplied with water and provisions; but they were not to be the residence of any artificers who made weapons, by the use of which the relations of the deceased might gratify their revenge. It was necessary that those who took refuge in these places should understand some occupation, that might prevent their being chargeable, whilst they were waiting for their trial. In order to excite and maintain the greater horror even of involuntary bloodshed, the law punished it by a kind of banishment, for the accused person was to remain in this city, without departing from it, till the death of the high-priest, but after the high priest's death, he might safely go wherever he pleased.

REFUGEES, French Protestants, who, by the revocation of the edict of Nantes, in 1685, have been constrained to quit their country, and retire for refuge into Holland, Germany, England, &c. to save themselves from the necessity of abandoning their religion.

REFUGIO, El, in Geography, a harbour in one of the islands of Mayorga, where Mauere was supplied with water in 1784, and which, he says, affords shelter from the most furious winds. S. lat. 18° 30'. E. long. 177° 32'.

REFINGE, a town of Sweden, in the province of Halland; nine miles N.N.W. of Halmstad.

REFUSAL, in Law, is that where by law a right and power of having or doing something of advantage to him, and he declines it. An executor may refuse an executorship; but the refusal ought to be before the ordinary; if an executor be summoned to accept or refuse the executorship, and he doth not appear upon the summons and prove the will, the court may grant administration, &c. which shall be good in law till such executor hath proved the will; but no man can be compelled to undertake it upon the executorship, unless he hath intermeddled with the estate. (1 Leon. 154. Cro. Eliz. 553.) Where there are several executors, and they all refuse, none of them shall administer afterwards; but if there is a refusal by one, and the other proves the will, the refusing executor may administer when he will, during the life of his co-executor. (1 Rep. 28.) If there is but one executor, and he administers, he cannot refuse afterwards, and if once he refuse, he cannot administer afterwards.

There is a refusal of a clerk presented to a church, for want of literature, &c. and if a bishop once refuses a clerk for insufficiency, he cannot accept of him afterwards, if a new clerk is presented. (5 Rep. 59. Cro. Eliz. 27.) In action of trover and conversion, a demand of the goods, and refusal to deliver them must be proved, &c. 10 Rep. 56.

REFUTATION, Refutatio, in Rhetoric, that part of the answer made to an opponent, which disapproves what had been advanced by him.

REGA, in Geography, a river of Pomerania, which rises three miles N.W. of Dramburg, passes by Regenwalde, Plate, Grieffenberg, Treptow, &c., and then runs into the sea, 12 miles S.W. of Colberg.

REGA, a town of Egypt, on the left bank of the Nile; six miles N. of Atsfel.

REGAL, REGALIS, or Regalis, something belonging to a king. Regal is of the same import with royal; the former being formed of the Latin rex; the other of the French roi, king.

REGAL, Fr., a musical term, which the Encyclopédie defines, "fis, an ancient instrument composed of many ficks of sonorous wood of different lengths, forming a scale, played upon by an ivory ball fastened to the end of a fick." This is exactly the description of the flicaccio, said to be invented by the brother of Bremner, the late musician who wrote the book of instructions for playing upon it.

"Regal is, secondly, a spinet organized, or rather a small organ of two or three stops placed under a keyd instrument, very common in Spain and Italy. In France this kind of instrument is called a posifit." Craigne, an organbuilder in London about the middle of the last century, furnished organs of this kind to many harpichords and spinets in a virginal form. Smetzer, when he first came hither from Strasburg, was employed by Shudi to organize his harpichord.

But regal in all Roman Catholic countries is a portable organ used in processions, carried by one person and played by another. We have seen that use made of this kind of organ at Naples. The pipes are of reeds, for the lightness of carriage.

In the lift of Edward VI. and queen Elizabeth's musical establishments in the Sloane MSS. at the British Museum, among the instrument-makers, the regal-maker is allowed 20£ yearly. And in our own memory there was an office in the chapel royal under the title of "tuner of the regals;" but it was abolished, and united to some more useful officer in the chapel.

In the supplement to the folio Encyclopédie, we are told that the regal is a portable organ, which has no pipes, or at most such as are very short, the tones being produced by reeds. This we believe to be the truth. The instrument is sometimes fo small as to be set on a table.

REGAL Fijb. See ROYAL Fijb.

REGAL Sui. See Sui.

REGALE, in the French Jurisprudence, is a right belonging to the king over all benefices in that kingdom.

The regale consists in enjoying the revenues of bishoprics, during the vacancy of their fees, and of presenting to the benefices dependent on them, which become vacant during that time, and till such a beneficeor have taken the oath of fidelity, and have procured letters patent, to secure him from the regale.

The enjoyment of the fruits of the fee is called the temporal regale; that of presenting the benefices, the spiritual regale.

Some refer the origin of the regale to the time of Clovis; and say, the clergy granted this privilege to the king upon his defeating the Visigoths; others allege, that pope Hadrian I. gratified Charlemagne with it, in a council held at Rome. It is observed by others, that the regale was originally no more than a ward, or administration; and that the kings were only depositaries of the fruits of the vacant bishoprics; and appointed them to look to them during the vacancy.

It is added, that the kings of the first and second race never enjoyed any such privilege; and that it was only introduced in the twelfth century, in favour of investitures.

Whatever was the origin of the regales, it occasioned a very
very important and warm debate between Lewis XIV. and
pope Innocent XI. which began about the year 1678, and
was carried on with great animosity and contention for
several years after. Lewis was deftious, that all the churches
in his dominion should be subject to the regale. Innocent
pretended, on the contrary, that his claim could not be
granted with such univerfality; nor would he consent to
any augmentation of the prerogatives of this nature that
had formerly been enjoyed by the kings of France. Lewis
summoned, for settling this difpute, the famous assembly of
thirty-five bishops, and as many deputies of the second
order, which met at Paris in the year 1682, and which
extended the regale to all the churches in France, without
exception. In this convocation the ancient doctrine of the
Gallican church, that declares the power of the pope to
be merely spiritual, and also inferior to that of a general
council, was drawn up in four propositions, which were
folemly adopted by the whole assembly, and were pro-
pelled to the whole body of the clergy, and to all the uni-
versities through the kingdom, as a sacred and inviolable
rule of faith.

REGALE, Regalia, a magnificent treat, or entertainment,
given to ambassadors, or other perons of distinction, to en-
tertain or do them honour.

In Italy it is usual at the arrival of any traveller of emi-
nence, to fend him a regale, that is, a present of fruits,
sweetmeats, &c. by way of refreshment.

REGALIA, in Law, the royal rights or prerogatives of
a king.

These are reckoned by civilians to be fix. 1. Power of
judicature. 2. Power of life and death. 3. Power of
war and peace. 4. Mafferlca goods, as waifs, estrays, &c.

Regalia is also used for the several parts of the appa-
ratus of a coronation: as the crown, the sceptre with the
crofs, sceptre with the dove, St. Edward's staff, four fveral
swords, the globe, and the orb with the crofs, &c. used at
the coronation of our kings.

Regalia of the Church, are those rights and privileges
which cathedrals, &c. enjoy by grants, and other conce-
fions of kings.

Regalia is sometimes also used for the patrimony of a
church; as, regalia Sancti Petri. And more particularly,
for such lands and hereditaments as have been given by
kings to the church.

"Capiamus in manum nostram baroniam et regalia que

These regalia, while in possession of the church, were
subject to the fame services as all other temporal inherit-
ances; and after the death of the bishop they reverted to
the king, till he invested another with them; which, in
the reigns of William the Conqueror, and fome of his im-
mediate successors, was frequently delayed, and as oft did
the bishops make complaint of it, as appears from Malm-
bury, Neubrgenfis, &c.

This last author fays, that great complaint was made
against Henry II. "Quodepipicus vacantes, et pro-
venientia percerper commoda, diu vacare voluit, et ecle-
siaflates potius usibus applicanda in hfeum redegit?"

Regalia Facere is used for the bishoP's doing homage,
or fealty, to the king, when he is invested with the regalia.
Thus Malmury, in Anfelm: "Regalia pro more illius
temporis faciens principi vi. kalend. Octobris Cantuarii
affedit."

REGALITIES. See Royalties.

REGAN, in Geography, a town of Persian, in the pro-
vince of Kerman, and district of Nurmanfier, on the
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frontier of Kerman to the cast, which district is about 92
miles in length, and in breadth from 30 to 80. This dis-

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tRICT is bounded on the N. and S. by a range of mountains,
thoie to the S. being covered with snow during the greater
part of the year. The foil is fertile, the district populous,
and well watered by freams from the mountains, and the
climate hot in the plain, but cool on the mountains. The
Afghans were lately expelled from this district by the Per-
fians, who invited different tribes of Balouches to occupy
the deferted villages.

Regan is a neat little town, surrounded by a mud wall,
within which the cattle of the inhabitants are driven every
night for protection. The fort is quadrangular, the walls
high and in good repair, and flanked with baftions, with
one gate, conflantly guarded for preventing the entrance of
strangers. The capital of Nurmanfier is Krock, which is
the residence of the governor, and built in the fame fyle
as Regan, but larger, and surrounded by a deep ditch.
Before the expulsion of the Afghans, a city, called Bumm,
was considered as the frontier town of Perifia in this quarter.
This city is strongly fortified by a high mud wall, flanked
with towers, surrounded by a deep and broad dry ditch,
with one gate; and it has a bazar tolerably supplied with
dates, milk, and fruit. The ruins of Bumm tell us that
it was formerly of much greater extent than it is at pre
cent. The fountains are faid to have thrown water to an
amazing height, and the gardens, which appear to have been
walled in, and adorned with elegant fummer-houses, produce
the most delicious pomegranates. Kinners' Geog. Memoir
of the Perifian Empire, 1813.

REGARD of the Forest, the overight, or inspection,
of it; or the office and province of the regarder; which
is, to go through the whole forest, and every bafilew
of it, before the holding of the feffions of the forest, or
justice-feft, to see and enquire of the trefpaffes in it, and
for the survey of dogs. A court for this purpose is to
be held every third year. See Expedition, and
Forest.

"Ad vivendum, ad inquirendum, ad certificandum, &c."
See Regarder.

Regard is also used for the extent of the regarder's
charge, i.e. for the whole forest; or all the ground that
is parcel of it.

REGARDANT, in Heraldry, is understood of a lion,
or other beast of prey, borne in a posture of looking
behind him, with his face towards his tail.

Others apply it to a beafl, which only shows the head,
and some part of the neck, as moving from out of some
division of the coat into another. He bears azure, three
bends, or, in a chief, argent, charged with a lion regardant,
gules.

Regardant Villain, or Regardant to the Manor, de-
notes an ancient servant or retainer to the lord; thus
called, because charged to do all base services within the
manor, to fee the fame freed of all filthy and loathsome things
that might annoy it, &c. Coke upon Littleton, fol. 120.

REGARDER of a Forest, Regardador of a Forefit, an ancient
officer of the king's forest, whole business was every year,
on oath, to make a regard, i.e. to take a view of the
forest limits; also to enquire of all offences and defaults
committed by the foresters within the forest, and of all
the concealments of them; and whether all the other officers
did execute their respective duties or not.

Manwood refers this institution to king Henry II. but
Spelman thinks the name, at least, was given since; and
that they were the fame with those officers called cfusados
veraticos.
REGATTA is a name given at Venice to a kind of exhibition on the water, in which the gondoliers contest for superiority in the art of rowing their gondolas. A splendid entertainment, under this appellation, was exhibited on the Thames in 1775.

REGAU, in Geography, a town of Austria; 12 miles W. of Steyr.

REGENSBERG, in Geography, a town of Switzer-land, in the canton of Zurich, situated on a mountain, and surrounded with walls in the year 1687: it is the principal place of a bailiwick formerly subject to the dukes of Austria. It has seven miles N. of Brugg.

REGENSTORF, in Geography, a town of Switzerland, in the canton of Zurich, which derives its name from that of an ancient cattle, destroyed in 1443.

REGENT, a person who governs a kingdom during the minority or absence or incapacity of a king. It is also used for a professor of arts and sciences, who holds a chair, or of pupils, in a college. The foreign universities are generally composed of doctors, professors, and regents. Regent and scholar are relative terms. See TITION.

Regent is generally restricted to the lower classes, as regent of rhetoric, regent of logic, &c.; these of philosophy are rather called professors.

REGENWALDE, in Geography, a town of Hinder Pomerania, on the Rega; 30 miles N.N.E. of Stargard. N. lat. 53° 10'. E. long. 15° 24'.

REGENDARIUS, among the Romans, an officer who subscribed and kept a register of all petitions presented to the prefect. Pitisc. in voc.

REGESTOLA, in Ornithology, a name used by some authors for the magpies, or larger butcher-bird, a very small hawk, not exceeding the size of a common thrush, but very fierce and voracious. See Lanius Excubitor.

REGETZ, in Geography, a town of Hungary. 18 miles S. of Czachau.

REGGE, a river of Holland, which rises near Enschede, and, after passing by Ghent, Ryden, &c. joins the Veel near Ommens.

REGGIO, Pietro, in Biography, a native of Genoa, who seems to have been the first Italian who gave our country a taste for the vocal refinements of his country. Before his arrival here, he had been in Spain, Germany, Sweden, and France. Besides refinements of florid song, he was much admired for his exquisite manner of accompanying himself on the lute. His first residence in England was at Oxford, where he published, in 1677, a small tract, entitled "A Trea
tife to sing well any fong whatever." In 1684 his book of fongs, in folio, the words chiefly from Cowley, appeared. We know not what were the taste and expression which rendered his vocal powers so captivating; but his airs are very dry and monotonous, and in as old an Italian taste as those of Lilli.

REGGIO, in Geography, a city of Italy, capital of the department of the Cruftolo, and formerly of the duchy of Modena, the fees of a bishop, suffragan of Bologna. It was founded by the Tuscan, and became a Roman colony under Lepidus the triumvir. It was destroyed by Alaric, and rebuilt by Charlemagne. Its number of convents is 16, and of inhabitants about 18,000. The cathedral contains many capital pictures and sculptures. The inhabitants of this city were the first of all the Italians, who in 1704 renounced their allegiance to their own sovereign, Her
cules III., who fled to Venice, afterwards took up arms, and solicited the protection of Bonaparte. He took possession of the city, proclaimed the liberty of the inhabitants, and instituted a legislative committee, who took the oath of allegiance to the French republic. Reggio is the native place of the poet Ariofto: 14 miles W. N.W. of Modena. N. lat. 44° 41'. E. long. 10° 38'.

REGNO, a sea-port town of Naples, in Calabria Ultra, situated on the straits of Meggina. The inhabitants carry on manufactures of stockings, gloves, and waffcoats of thread or silk. This place is the seat of an archbishop, founded by the patriarch of Constantinople, and contains two colleges and seven convents. The environs abound in oranges, citrons, mulberries, and grapes, with some fugarcanes. This town was called by the Greeks Rhégin, derived according to Diodorus from the Greek word ῥήγον, to break or tear, because Sicily was torn from Italy, either by the sea or an earthquake. It is very ancient, founded as some say by Jocalrus, son of Jolus, king of Lipari, who entertained Ulysses; or, according to others, by the Chalcidians, who came hither from Euboea. The territory of the Rhegini was free and powerful, though sometimes governed by tyrants. In the Peloponnesian war they suffered much from their neighbours the Epizephyrian Locri, and were disftracted by internal contentions. In the time of Dionysius the elder they were very powerful and afeerted their liberty, refusing an alliance with that tyrant, who demanded a daughter of the city. When Pyrrhus waged war against the Romans, the latter sent a legion for the protection of Rhegium; but the soldiers murdered the citizens and set fire on the city. After the war the insurgents were taken by the Romans, and put to death for their treachery and cruelty. St. Paul, on his journey to Rome, passed through this city. In the year 1783 it was almost totally destroyed by
by an earthquake; 10 miles S.E. of Mellina. N. lat. 38° 60.
E. long. 16° 53' 1.

REGGIOLO, a town of Italy, in the department of the
Mincio; six miles E. of Guelfalla.

REGHABILLE, a town of Africa, in the country of
Wangara, situated on a lake. N. lat. 12° 47'. E. long.
18° 19'.

REGIA AQUA. See AQUA.

REGIA Via. See VIA.

REGIA Villa. See VILLA.

REGICIDE, REGICIDA, a king-killer. The term is
also used for the act itself of murdering a king; of rex, king,
and caedo, I slay.

Regicide is chiefly used with us in speaking of the persons
concerned in the trial, condemnation, and execution, of king
Charles I.

REGIFUGE, REGIFUGIUM, a feast held in ancient
Rome on the sixth of the calends of March, i.e. on our
24th of February, in memory of the expulsion of their
kings, particularly of Tarquin's flying out of Rome on that
day. Some will have the feast to bear this name from the
rex factorum, king of the sacrifices, flying out of the comitia,
or place of assembly, as soon as the sacrifice was over, in
imitation of the flight of Tarquin the Proud.

Some critics and antiquaries will have Regifugium the
name with Fugalia; others hold them to be different.

REGIMEN, in Medicine, from rego, I rule or govern,
a rule or course of living, with regard to eating, drinking,
clothing, and the like, accommodated to some disease, or
particular course of medicine which the patient is under,
or intended as a prevention of some threatening malady.

In many diseases, especially those of the acute or febrile
class, the regimen is often of equal, and sometimes of more
importance than medicine; and there can be no doubt that the
medical physicians, by the introduction of a hot regimen in
the treatment of febrile complaints, contributed to render
these diseases more severe and fatal; and that the substitution
of a cool regimen has of late years very materially
diminished the danger and mortality of these maladies.

This change in medical practice has been, in fact, but a return
to nature, and to Hippocrates, who taught this simple, but
clear and rational principle, "contraria contrariis medentur;"
remedies should be of an opposite nature to diseases: that
is to say, if the body is morbidly hot, cold is the remedy; if
it is cold, the application of heat is necessary; if there is
over-dilatation, inflammation, or plethora, evacuation must
be resorted to: if depletion, we must supply nourishment:
if there is thirst, the remedy is the free 3ule of drink, and
so forth.

The clear infinities of nature (where they can be
distinguished) are commonly infallible guides, as to the
regimen to be pursued; but let not morbid habits and preju-
dices be mistaken for them. Thus in all fevers, small-pox,
measles, scarlet-fever, catarrh, typhus, and the plague
itself, the natural bias is for fresh air, coolness, light bed-
clothes, clean linen, cold drink, light and merely liquid
nourishment, in small quantities, or absolute abstinence,
quietness of mind and body, relief from noise, strong light,
and every species of excitement; and this is precisely the
regimen, which experience has proved to be most beneficial
in such diseases. Under the influence of such a regimen,
where proper medicines are also employed, every symptom
is rendered comparatively mild; the distress of the sick is
diminished, by the soothing of every morbid sensation; and
the dérangements, which would otherwise ensue, or be ag-
gravated, in the more vital organs, as the brain, lungs,
and alimentary canal, are frequently altogether pre-
vented.

It is sufficient to contrast the effects of the hot regimen,
in febrile diseases, to be convinced of the truth of these
observations. When a person afflicted with any species of
fever, is confined in a close and heated apartment, in which
the free circulation of air is prevented by closed doors and
windows, curtains, etc., and is kept at the same time under
a load of bed-clothes, and supplied with hot drinks, or even
cordials of vinous and fermented liquors, with the view of
inducing perpiration, the consequences are as follow. The
whole train of symptoms is aggravated. The heat of the
patient is raised considerably above the natural standard,
notwithstanding the profuse periphrases that are constantly
bathing him; the pulse is excited to the highest febrile stand-
ard; the thirst becomes incessant to supply the unnatural
waste of fluids; the mouth and lips become parched and
furred; the head is in constant pain, with confusion of ideas,
preventing all food from, and occasioning diarrheal dreams,
and at length delirium; the whole powers of the frame be-
come prostrate, with disposition to fainting, on being moved,
or on passing an evacuation by flood; and from this situa-
tion the recovery is extremely precarious. In cases of contageous
fever, such as small-pox, measles, scarlet-fever, etc., the
eruption is always greatly multiplied by this hot regimen,
and all the symptoms are changed to what has been called a
putrid type; the tongue, teeth, and lips become coated with
a black, clammy, and nauseous fur; purple in spots appear on the skin; and the whole disease assumes the char-
er of malignancy. There is one disease, indeed, which is
felly the result of this hot regimen, which has made a con-
siderable figure in the writings of physicians, who never
dreamt that it was of their own creation; we allude to the
military fever. See MILIARIA.

The above may perhaps be considered as the extreme of the
picture, which is scarcely ever to be seen in the present
day. But the greatest difficulty which a physician has even
now to overcome, in the majority of cases of feverish diseases,
is to counteract the tendency of nurses and parents to the
adoption of more or less of this pernicious system. The fa-
litary chill must be taken away from all liquids, whether
used internally or externally; the cheering breeze is deemed
a death-bringing draught; and though the patient may die
from the severity of a malignant fever, he must on no account
run the slightest risk of catching cold; that is to say, the
possible occurrence of a slight fore-throat, or a running at
the nose, is to be avoided religiously, at the expense of ag-
gravating both the sufferings and the danger, under a more
formidable disease. The use of wine and cordials, in these
diseases, is now confined to the poor and ignorant, and it is
to be hoped, that the other parts of the hot regimen will
not long be restored to, at least among the more intelligent
classes of society. See COLD as a remedy.

REGIMEN, in Chemistry and Alchemy, is the method of
ordering and conducting any thing, that it may answer its
intention.

Thus, regimen of fire is the method of making and order-
ing fire, and the degrees of it.

Regimen of the Work, that is, of the philosopher's stone,
called the work of patience, is the rule and conduct to be ob-
erved to obtain protection.

There are three things, they say, to be chiefly regarded
in the regimen of the work. The first, to administer a gentle
calm heat at the beginning of the coction.

The second, to continue this external heat according to the
season of the work, always observing four seasons, as in the
common and astronomical year; the beginning being in the
winter, the progress the spring, then summer, and finally autumn, which is the time of maturity and perfection of the
stone;
in which the heat is to be augmented in proportion to the augmentation observed in nature.

It is to be added, that the work may not be begun in any season; but regard is to be had to the feasons of nature, lest the winter of the work be found in the summer of the year, &c. Which, however, is to be understood of the day in which the mercury is put in the ovum philosophicum, not of that when it is begun to be set at liberty from the prions which nature had included in it.

The third is, that in augmenting the fire, the augmentation be not of a whole degree at once; the spirits being unable to bear such violence; but a degree is to be divided into four parts, and each part is to be taken at a time.

All the operations of the first regimen are occult and invisible: in the second regimen comes ptrefercation, which, they say, is the first sensible change, shewing itself by its black colour.

Regimen, or Government, in Grammar, is that part of Syntax or Construction, which regulates the mutual dependency of words, and the alterations which one part of speech occasions in another, with regard to its mood, tense, or case, and thus it differs from concord, or the agreement which one word has with another, in gender, number, case, or person. See Concord.

The regimen, or government, is entirely arbitrary, and differs in all languages; one language forming its regimen by cases, as the Latin and Greeks; others by particles in lieu of them, as the English by of, to, &c. the French, Spaniards, and Italians, by de, a, et, &c.

There are, however, some general maxims which hold good in all languages: as 1. That there is no nominative case in any sentence but has a reference to some verb, either expressed or understood. Sometimes, indeed, the infinitive mood, or part of a sentence, is put as the nominative case to the verb; as in English, "to see the sun is pleasant." These sentences, or clauses, thus constituting the subject of an affirmation, may be termed "nominative cases."

2. That there is no verb, except in the infinitive mood, or the participle, but has its nominative case, either expressed or understood. Indeed, in languages which have proper accusatives, as the Latin, before infinitives there is an accusative, not a nominative case; as Seio Petrum effe deditum. The nominative case is commonly placed before the verb; but sometimes it is put after the verb, if it is a simple tense; and between the auxiliary and the verb, or participle, if a compound tense.

3. Two or more nouns, &c. in the singular number, joined together by one or more copulative conjunctions, expressed or understood, must have verbs, nouns, and pronouns, agreeing with them in the plural number. The conjunction disjunctive, however, has an effect contrary to that of the conjunction copulative; for as the verb, noun, or pronoun, is referred to the preceding term, taken separately, it must be in the singular.

4. A noun of multitude, or signifying many, may have a verb or pronoun agreeing with it, either of the singular or plural number; but not without regard to the import of the word, as conveying unity or plurality of idea. In the application of this rule, we ought to consider whether the term immediately fuggetts the idea of the number it represents, or whether it exhibits to the mind the idea of the whole as one thing. In the former case, the verb ought to be plural; in the latter, it ought to be singular.

5. Pronouns must always agree with their antecedents, and the nouns for which they stand, in gender and number.

6. The relative is the nominative case to the verb, when no nominative comes between it and the verb; but when a nominative comes between the relative and the verb, the relative is governed by some word in its own member of the sentence; e. g. "he who prefers me, to whom I owe my being, whom I am, and whom I serve, is eternal."

7. When the relative is preceded by two nominatives of different persons, the relative and verb may agree in person with either, according to the sense.

8. Every adjective, and every adjective pronoun, belongs to a substantive, expressed or understood. Adjective pronouns must agree in number with the substantives; nevertheless this rule admits of exceptions; e. g. the word mea in the singular number, and the phrases "by this means," "by that means," are used by our best and most correct writers, e. g. Bacon, Tillotson, Atterbury, Addison, Steele, Pope, &c. Campbell, in his "Philosophy of Rhetoric," has this remark on the subjunctive before us: "No prepositions of that will, I presume, venture so far to violate the present usage, and consequently to shock the ears of the generality of readers, as to say 'by this means,' 'by that means.'" Lowth and Johnson seem also to be against the use of means in the singular number. The distributive adjective pronouns, each, every, either, agree with the nouns, pronouns, and verbs of the singular number only. Adjectives are sometimes improperly applied as adverbs. An adjective pronoun, in the plural number, will sometimes properly associate with a singular noun. Although the adjective always relates to a substantive, it is, in many instances, put as if it were absolute, especially where the noun has been mentioned before, or is easily understood, though not expressed. Substantives are often used as adjectives in this case, the word to used is sometimes unconnected with the substantive to which it relates; sometimes connected with it by a hyphen; and sometimes joined to it, so as to make the two words coalesce. Sometimes the adjective becomes a substantive, and has another adjective joined to it. When an adjective has a preposition before it, the substantive being understood, it takes the nature of an adverb, and is considered as an adverb.

9. One substantive governs another, signifying a different thing, in the pollesive or genitive case; as much as that case always expresses the possessor, which must be governed by the possessor: as, "my father's house," "virtue's reward," &c. When the annexed substantive signifies the same thing as the first, and serves merely to explain or describe it, there is no variation of case; as, "George, king of Great Britain, elector of Hanover, &c." Nouns thus circumstanlaced are said to be in apposition to each other; and nouns are not unfrequently set in apposition to sentences, or clauses of sentences. This rule does not hold so apparently in the modern as it does in the ancient languages, because the particles of, de, &c. which are the proper signs of the genitive case, are frequently used as prepositions. (See Genitive.) Substantives govern pronouns as well as nouns in the possessive case; as "every tree is known by its fruit." Sometimes a substantive in the genitive or possessive case stands alone, the latter one by which it is governed being understood. The English genitive has often an unpleasant found, so that we make more use of the particle of to express the same relation: and in some cases, we use both the genitive termination and the preposition of; as "it is a discovery of Sir Isaac Newton's," but when this double genitive, as some grammarians call it, is not necessary to distinguish the one or the other, it is generally omitted. Except to prevent ambiguity, it seems to be allowable only in cases which for suppose the existence of a plurality of subjects of the same kind, as "a subject of the emperor's." But after all that can be said for the double genitive, as it is termed,
termed, it is the opinion of some grammarians, that it would be better to avoid the use of it altogether, and to give the sentiment another form of expression.

10. A active verbs govern the objective (or accusive) case, as "Virtue rewards her followers." In English, the nominative case, denoting the subject, usually goes before the verb; and the objective case, denoting the object, follows the verb active; and it is this order that determines the case in noun: as, "Alexander conquered the Persians;" but the pronoun having a proper form for each of those cases, is sometimes, when it is in the objective case, placed before the verb; and when it is in the nominative case, follows the object and verb: as "when ye ignorantly worship, him declare I unto you." Verbs neuter do not act upon, or govern, nouns and pronouns. Part of a sentence, as well as a noun or pronoun, may be said to be in the objective case, or to be put objectively, governed by the active verb; and sentences or phrases under this circumstance may be termed "objective sentences or phrases." The verb to be, through all its variations, has the same case after it as that which next precedes it: so that this substantive verb has no government, or case, but serves, in all its forms, as a conductor to the two cases, in which the two cases, which in the construction of the sentence, are the next before and after it, must always be alike. Passive verbs which signify naming, and others of a similar nature, have the same case before and after them; as "he was called Caesar." It is evident also, that certain other neuter verbs, besides the verb to be, require the same case, whether it be the nominative or the objective, before and after them; such verbs are, to become, to wander, to go, to return, to appear, to die, to live, to look, to grow, to seem, to roam, and several others. The auxiliary let governs the objective case; as "let him beware."

11. One verb governs another that follows it, or depends upon it, in the infinitive mood: as, "cease to do evil," "learn to do well;" and the preposition to, though generally used before the latter verb, is sometimes properly omitted; as "I heard him say it," instead of "I heard him say it." This irregularity extends only to active or neuter verbs: for many other verbs, when made passive, require the preposition to before the following verb: as "He was seem to go." The infinitive is frequently governed by adjectives, substantives, and participles; and this mood has much of the nature of a substantive, expressing the action itself which the verb signifies, as the participle has the nature of an adjective, so that the infinitive mood does the office of a substantive in different cases, as in the nominative, "to play is pleasant," and in the objective, "boys love to play." The infinitive mood is often made absolute, or used independently on the rest of the sentence, supplying the place of the conjunction that with the potential mood, as "to confess the truth, I was in fault." The preposition to, signifying in order to, was anciently preceded by for, as "what went ye out for to see;" but the word for before the infinitive, is now, in almost every case, obsolete.

12. In the use of words and phrases which, with respect to time, relate to each other, a due regard to that relation should be observed. Thus, instead of saying, "the Lord hath given, and the Lord hath taken away," we should say, "the Lord gave, and the Lord hath taken away." To preserve consistency in the time of verbs, and also of words and phrases, says Mr. L. Murray, in his excellent treatise on Grammar, we must recollect that, in the subjunctive mood, the present and the imperfect tenses often carry with them a future sense; and that the auxiliaries should and could, in the imperfect time, are used to express the present and future, as well as the past. With regard to verbs in the infinitive mood, says the same popular author, the practice of many writers, among whom are some of the most respectable, appears to be erroneous. They seem not to advert to the true principles which influence the different tenses of this mood. The following rules will, according to our author's judgment, be found perspicuous and accurate. "All verbs expressive of hope, desire, intention, or command, must invariably be followed by the present, and not the perfect of the infinitive." Instead of the phrase, "the last week I intended to have written," though common, the infinitive being in the past time, as well as the verb which it follows, it ought to be, "the last week I intended to write:" for how long sooner it now is since I thought of writing, "to write" was then present to me, and must still be considered as present, when I bring back that time, and the thoughts of it. Some writers on grammar, however, maintain that the former sentence is correct and grammatical, because, as they affirm, it simply denotes the speaker's intention to be hereafter in possession of the signified action of writing; but this reason is admitted of the following answers, according to the statement of Mr. Murray. The phrase "to have written" is, in English grammars, the established past tense of the infinitive mood, and as incontrovertibly the past tense of the infinitive in English, as scripsi is the past tense of the infinitive in Latin; nor can any writers be warranted in taking such liberties with the language, as to contradict its plain rules, for the sake of supporting an hypothesis. Moreover, these writers might, on their own principles, and with equal propriety, contend, that the phrase "I intended having written," is proper and grammatical; but by admitting such violations of established grammatical distinctions, confusion would be introduced, the language would be disorganized, and the most eccentric systems of grammar might be advanced, and plausibly supported. In short, says our author, the phrase "I intended to have written," appears to involve the following absurdity; "I intended to produce hereafter an action or event, which has already been completed." Some may hastily infer from the rule above stated, and from the near relation between the verbs to defere, and to wish, that the latter verb, like the former, must invariably be followed by the present of the infinitive. But when any one considers, that the act of desiring always refers to the future, and that the act of wishing refers sometimes to the past, as well as sometimes to the future, he will perceive the distinction between them, and that, consequently, the following modes of expression are strictly justifiable: "I wished that I had written sooner," "I wished to have written sooner;" and he will be perfectly satisfied, that the following phrases must be improper: "I desired that I had written sooner," "I desired to have written sooner," Mr. Murray, having considered and explained the special rule, respecting the government of verbs, expressive of hope, desire, intention, or command, proceeds to state and elucidate the general rule, on the subject of verbs in the infinitive mood. "This rule," he says, "is founded on the authority of Harris, Lowth, Campbell, Pickbourn, &c.; and we think, too, on the authority of reason and common sense. "When the action or event, signified by a verb in the infinitive mood, is contemporary or future, with respect to the verb to which it is chiefly related, the present of the infinitive is required; when it is not contemporary, nor future, the perfect of the infinitive is necessary." To comprehend and apply this rule, the student has only to consider, whether the infinitive verb refers to a time antecedent, contemporary, or future, with regard to the governing or related verb. When this simple point is ascertained, there will be no doubt in his mind, respecting the form
form which the infinitive verb should have. A few examples may illustrate these positions. If I wish to signify, that I rejoiced at a particular time, in recollecting the sight of a friend, some time having intervened between the seeing and the rejoicing, I should express myself thus: "I rejoiced to have seen my friend." The seeing, in this case, was evidently antecedent to the rejoicing; and therefore the verb which expresses the former, must be in the perfect of the infinitive mood. The same meaning may be expressed in a different form: "I rejoiced that I had seen my friend," or, "in having seen my friend." And the student may, in general, try the propriety of a doubtful point of this nature, by converting the phrase into these two correspondent forms of expression. When it is convertible into both these equivalent phrases, its legitimacy must be admitted.—If, on the contrary, I wish to signify, that I rejoiced at the sight of my friend, that my joy and his presence were contemporary, I should say, "I rejoiced to see my friend," or, in other words, "I rejoiced in seeing my friend." The correctness of this form of the infinitive may also, in most cases, be tried, by converting the phrase into other phrases of a similar import.

The subject may be still further illustrated, by additional examples. In the sentence which follows, the verb is with propriety put in the perfect tense of the infinitive mood: "It would have afforded me great pleasure, as often as I reflected upon it, to have been the messenger of such intelligence." As the message, in this instance, was antecedent to the pleasure, and not contemporary with it, the verb expressive of the message must denote that antecedence, by being in the perfect of the infinitive. If, on the contrary, the message and the pleasure were referred to as contemporaneous, the subsequent verb would, with equal propriety, have been put in the present of the infinitive: as, "It would have afforded me great pleasure, to be the messenger of such intelligence." In the former instance, the phrase in question is equivalent to these words: "If I had been the messenger;" in the latter instance, to this expression: "being the messenger."

To assert, as some writers do, that verbs in the infinitive mood have no tenses, no relative distinctions of present, past, and future, is inconsistent with just grammatical views of the subject. That these verbs associate with verbs in all the tenses, is no proof of their having no peculiar time of their own. Whatever period the governing verb assumes, whether present, past, or future, the governed verb in the infinitive always respects that period, and its tense is calculated from it. Thus, the time of the infinitive may be before, after, or the same as, the time of the governing verb, according as the thing signified by the infinitive, is supposed to be before, after, or present with, the thing denoted by the governing verb. It is, therefore, with great propriety, that tenses are assigned to verbs of the infinitive mood. The point of time from which they are computed is of no consequence; since present, past, and future, are completely applicable to them.

It may not be improper to observe, that though it is often correct to use the perfect of the infinitive after the governing verb, yet there are particular cases, in which it would be better to give the expression a different form. Thus, instead of saying, "I wish to have written to him sooner," "I then wished to have written to him sooner," "I will one day wish to have written to him sooner," it would be more periphrastic and forcible, as well as more agreeable to the practice of good writers, to say: "I wish that I had written to him sooner," "I then wished that I had written to him sooner," "He will one day wish that he had written sooner."

13. Participles have the same government as the verbs from which they are derived; as, "I am weary with hearing him," &c. It should be considered, however, that participles are sometimes governed by the article; for the present participle, with the definite article the before it, becomes a subjunctive, and must have the preposition of after it. This rule arises from the nature and idiom of our language, and from as plain a principle as any on which it is founded; namely, that a word which has the article before it, and the possessive preposition of after it, must be a noun; and, if a noun, it ought to follow the construction of a noun, and not to have the regimen of a verb. It is the participial termination of this sort of words that is apt to deceive us, and make us treat them as if they were of an amphibious species, partly nouns and partly verbs.

The same observations, which have been made respecting the effect of the article and participle, appear to be applicable to the pronoun and participle, when they are similarly associated. When a subjunctive is put absolutely, and does not agree with the following verb, it remains independent of the participle, and is called the "cafe absolute," or the "nominative absolute," but when the subjunctive preceding the participle agrees with the subjunctive verb, it loses its absoluteness, and is like every other nominative.

15. Prepositions govern the objective after. Under this rule we may remark, that the prepositions to and for are often understood, chiefly before the pronouns, as "give me the book," for to me, &c. The preposition is often omitted from the relative which it governs; as "whom will you give it to?" for "to whom will you give it?" Some writers separate the preposition from the noun or pronoun which governs, in order to connect different prepositions with the same word; but this kind of construction is always inelegant, and should generally be avoided. Different relations, and different tenses, must be expressed by different prepositions, though in conjunction with the same verb or adjective. Thus we say, "to converse with a person, upon a subject, in a house, &c." When prepositions are subjoined to nouns, they are generally the same that are subjoined to the verbs from which the nouns are derived. Many writers, as Dr. Prievaly has observed, affect to subjoin to any word the preposition with which it is compounded, or the idea of which it implies, in order to point out the relation of the words, in a more distinct and definite manner, and to avoid the more indeterminate prepositions of and to; but general practice, and the idiom of the English tongue, seem to oppose the innovation. Thus many writers say, "averse from a thing!" but others use "averse to it," which is more truly English: "Averse to any advice," Swift. The words averse and aversion, says Dr. Campbell, "are more properly confined with than with from. The examples in favour of the latter preposition are beyond comparison outnumbered by those in favour of the former. The argument from etymology is here of no value, being taken from the use of another language. If, by the same rule, we were to regulate all nouns and verbs of Latin original, our present syntax would be overturned. It is more conformable to English analogy with to; the words dislike and hatred, nearly synonymous, are thus confused."

16. Conjunctions connect the same moods and tenses of verbs,
Some conjunctions require the indicative, some the subjunctive mood, after them. Those that are of a positive and absolute nature belong to the former class; e.g., "As virtue advances, so vice recedes." When something contingent or doubtful is implied, the subjunctive ought to be used, as "If I were to write, he would not regard it." See Subjunctive.

18. When the qualities of different things are compared, the latter noun or pronoun is not governed by the conjunction than or as, but agrees with the verb, or is governed by the verb or the preposition, expressed or understood; as "Thou art wiser than I," that is, "than I am." See the Nouns.

19. For the purpose of avoiding disagreeable repetitions, and of expressing our ideas in few words, an ellipsis, or omission of some words, is frequently admitted; e.g., instead of saying "He was a learned man, he was a wise man, and he was a good man," we say, availing ourselves of the ellipsis, "He was a learned, wise, and good man." See Ellipsis.

20. All the parts of a sentence should correspond to each other; so that a regular and dependent construction may, throughout, be carefully preferred. The following sentence is inaccurate; "He was more beloved, but not so much admired, as Cuthllo," it should be, "He was more beloved than Cuthllo, but not so much admired." See Ellipsis.

21. The regimen of verbs is frequently laid on different kinds of relations, according to custom or usage; which yet does not change the specific relation of each cafe, but only hews, that custom has made choice of this or that, according to fancy. Thus the Latinus fay, fave, aliquum, and opitulari aliquum, to help one. So the French fly, faire quelqu'un, and faire a quelqu'un, to help one. Thus the English say, fight one, or fight with one. And thus, in Spanish, most of the verbs active govern differently either a passive or an accusive. Sometimes, also, the verb admits of several regimen; as preflare alium, or aliquo; cribre morti aliquum, or aliquum morte.

Indeed, the different regimen sometimes makes an alteration in the sense; in which particular regard is to be had to the usage of the language. Thus, the Latin casaret aliquum signifies to catch, or be cautious of the precaution of any one; casaret aliquum signifies to beware of him.

There is one very common fault in regimen, which our accurate writers should be careful to avoid; viz., the using of two verbs that require different cafes together, as only governing one cafe; as in this example; after embracing and giving his blessing to his fon; where embracing requiring an accusative, and giving a dative cafe, the regimen or construction of the first verb with the noun is irregular; embrace to a fon.

The fame may be observed in nouns; as, I conjured him by the memory and the friendship to bear my father; where memory does not agree with he bore.

For an ample illustration of these rules by appropriate examples, and also of the exceptions which pertain to each respectively, we refer to Mr. Murray's English Grammar, vol. i. ch. 12. See Concord and Syntax.

Regiment, or Conjunction. Status of, Status regimenis, a phrase used by Hebrew grammarians in contradistinction to the absolute substantive or flatus absolutus. A noun in flatus absolute is that which does not govern either a genitive or any other cafe; and it is said to be in regimen or in conjunctions, when it does govern such cafe. Nouns of the former kind seldom undergo any change in the letters that form them, as בּיָנָן יִבְרָעֵל, just kings, whereas the latter either lofe one of their letters, or undergo a change of one into another; but these latter admit of excepted cafes; e.g., flatus masculine nouns undergo no change in regimen יִבְרָעֵל, king of the land, and plurals throw off the final letter, as נָבְיֵי יִבְרָעֵל, kings of the earth, for נָבְיֵי יִבְרָעֵל. This is also the case with participles, as נָבְיֵי יִבְרָעֵל, working iniquity, and נָבְיֵי יִבְרָעֵל, workers of iniquity. Singular feminine nouns ending in יִבְרָעֵל change the יִבְרָעֵל in regimen into יִבְרָעֵל, the kingdom of heaven. We shall here observe, that the change which takes place on account of the name of regimen is made in the governing noun, and not in that which is governed, contrary to the practice in other languages. For other particulars referring to regimen in Hebrew, as well as in Latin, Greek, and other learned languages, we refer to the article Syntax.

Regiment, derived from the Fr. regie, of regere, to govern, or from the Fr. regime, denoting system or administration, in War, a body consisting of several troops of horse, or companies of foot, commanded by a colonel, lieutenant-colonel, and major; or, as Sir James Turner defines it, a certain number of companies joined in one body, under one head. A regiment of cavalry consists of one or more squadrons; and a regiment of infantry of one or more battalions.

The number of men in a regiment is as undetermined as that of the men in a troop, or company; in a squadron or battalion.

A battalion in each regiment of foot is divided into companies, but the number of companies is various; though, in England, our regiments are generally ten companies; two of which are called the flanks; one on the right, consisting of grenadiers, and another on the left, formed of light troops. The squadrons in cavalry, or in regiments of horse, are divided, sometimes into six, and sometimes into nine troops. Each regiment has a chaplain, quarter-master, adjutant, and surgeon. It has been suggested, that every regiment of foot should consist of 2,400 men, making three battalions of 800 each.

Some German regiments consist of 2,000 foot; and the regiment of Picardy in France consists of 120 companies, or 6,000 men.

The French have distinguished between the commanding officer of a regiment of cavalry, and the commanding officer of a regiment of infantry; the former having been called "maître de camp," and the latter "colonel," as with us. According to the present establishment of the French army, the term "regiment" is confined to the cavalry and artillery, and the name of half brigade is given to the infantry, so that "chef de brigade," chief of brigade, corresponds with our colonel of a regiment of infantry. In the French cavalry the term colonel is still retained.

Some obverse, that there were no regiments of horse before the year 1637. Till then the troops were loose and independent of each other, and not incorporated into a body or regiment.

Regiments, it is said, were first formed in France, under the reign of Charles IX. though F. Daniel refers them to the time of Henry II. and in England to the year 1660. Grose observes, that we may, without being very much mistaken, place the introduction of regiments and colonels about the reign of king Henry VIII.

We shall here annex a brief account of some of the principal regiments of the old corps. The first and second regiments of life-guards claim priority of notice. The life-guards
guards succeeded that body under the same denomination which was raised by Charles II., soon after the restoration, the privates of whom were taken from the cavalier gentlemen, who had adopted the profession of arms, and followed the fortunes of his father during the civil wars. As they were for the most part men of family, they possessed certain privileges, similar to those of the household troops in France, after whom they were modelled; and these privileges were continued long after the time when they ceased to be composed of the same class of men. It was, therefore, found necessary to reduce the privates, and to form a new corps, composed almost entirely of recruits under the old officers, and to place them nearly on the same footing with the rest of the cavalry; referring for them, however, the advantages arising out of a higher pay, and an exemption from stoppages on the part of the privates, whose clothing is furnished by government. The life-guards claim the privilege, that their officers are not liable to be tried by any court-martial, unless the members are composed of their own regiment, or of officers of the other household troops. The first regiment of life-guards, confining of very fine men, about 6 feet high at an average, was formed in 1788. The uniform is scarlet, faced with blue, and gold lace. The commissioned officers are a colonel, one lieutenant-colonel, one supernumerary lieutenant-colonel, two majors, five captains, six lieutenants, one adjutant and lieutenant, five cornets, one surgeon, and one veterinary surgeon. The non-commissioned officers consist of quarter-masters and corporals. The privates are about 250 in number. Their quarters are permanent at Knightbridge barracks. The second regiment is on the same footing with the first, and of the same establishment. The average height of the men is 5 feet 11¾ inches; the horses are from 16 to 18 hands high, of a black colour, with long tails. In this regiment, as well as the other, there are five troopers; each troop consisting of one captain, one lieutenant, one cornet, one quarter-master, three corporals, 40 privates, including a farrier, and one trumpeter. Each regiment has one kettle drummer. The officers usually ride bay-horses; the kettle drummers and trumpeters, grey. There are two "gold-ricks," one pertaining to each regiment: their duty is to attend alternately every month on his majesty. See Life-Guards.

A body of foot-guards was not regularly organized on the present plan till after the restoration. The regiment of general Monk, created duke of Albemarle, was, in compliment to him, retained on the establishment, when most of the other troops were disbanded. This regiment had been raised about ten years before the period alluded to, at Coldstream, in Scotland; and from this circumstance it assumed the name, which it has borne ever since. The year 1660 may thus be considered as the era of the formation of the foot-guards; and though other regiments were added, the Coldstream had the priority. The guards possess many peculiar honours and privileges: they have precedence of all others; their officers possess a higher rank in the army; and without expense to themselves, when on guard at St. James, they have a plentiful table kept for them by the public, and voted annually in the extraordinary of the army. The king's person, the royal family, the Tower, and, in times of danger, the bank of England, are in a particular manner under their protection. Their uniforms are royal, with blue facings, and their pay superior to that of the marching regiments. See Foot-Guards.

The corps, denominated the royal regiment of horse-guards, blue, commonly called Oxford blues, derives its appellation from the noble family of Oxford, who was its first colonel in 1661. This regiment has distinguished itself on a variety of occasions. The following circumstances are peculiar to this corps. It is the only regiment, denominated "horse," at present on the British establishment. The promotions, that of colonel excepted, are restricted to the regiment. The quarter-masters' commissions are signed by the king, so that they are properly termed commissio-officers; whereas in all the other cavalry, or dragoon regiments, quarter-masters are only warrant-officers. The average height of the men is 5 feet 10¾ inches. The uniform of the officers is blue, faced with scarlet, gold lace, and buff lining; of the privates, blue, with plain red lappets, very broad buff cross-belts, and gloves of the same colour. The troopers' horses are black, with long tails. The corps consists of nine troops; and to each troop belong four commissioned officers, five non-commissioned officers, and 54 private men: there are, besides, the colonel, one lieutenant-colonel, one major, an adjutant, a regimental surgeon and assistant, and a veterinary surgeon. See Horse-Guards.

The establishment of a royal regiment of artillery took place early in the last century; the first commission of colonel having been filled, as it is said, in the first year of the reign of George II. In a short time, the number of companies was augmented from four to eight. The uniform was blue, turned up with red, and waistcoats and breeches of the colour of the facings were then worn by the officers. The artillery take the right of foot on all parades, and like the dragoons, when dismounted. Each battalion consists of one colonel commandant, one ditto en-second, one first lieutenant-colonel, one second lieutenant-colonel, one major, ten captains, ten captain-lieutenants, thirty lieutenants, one adjutant, one quarter-master, one surgeon, and one assistant surgeon. The establishment of each company is 120 rank and file. The standard height of the men is 5 feet 9 inches, and upwards. The uniform of the officers is blue, faced with scarlet, gold epaulets, no lace, white waistcoat and breeches, boots, yellow plate on a white buff shoulder-belt. The uniform of the privates is blue, with red cuffs and collar, no facings, yellow lace, and buttons impressed with the ordnance arms. The fejeants wear frocked gold lace. The arms of the officers and fejeants are yellow-litde swords; of the corporals, bombardiers, and privates, carbine and bayonet. The horde artillery have fards and piftols. The officers rise in a regular gradation by seniority. See Artillery.

The first or royal regiment of foot claims a high degree of antiquity. It is undoubtedly the oldest regiment in the service. It is said to have been the body-guard of the Scotch kings, whence it has derived its name of the royal Scots, and to have been put upon the English establishment in 1633. The first colonel was nominated during the reign of Charles I.; but on the fatal issue of the civil wars to that monarch, this corps seems to have been disbanded. At the restoration of Charles II., this regiment was re-established. It consists of two battalions, both commanded by the same colonel; in every other respect they are considered as separate corps. The uniform of the officers is scarlet, faced with blue, gold lace embroidered; that of the private soldiers red, faced with blue and white lace.

The second, or queen's royal regiment of foot, was raised in the year 1661. The regiment being royal, the facings for the whole are blue; the lace for the privates white, with a blue stripe.

The third regiment of foot, called the "Buffs," was put upon the regular establishment of the army in the year 1665. It was denominated the "Buffs," from being the first whose accoutrements were made of leather prepared from the buffalo, after the manner of shaminos. The waistcoats, breeches, and
and facings of the coat, were afterwards directed to be made of a corresponding colour. When other regiments assumed this part of their appointment, the third acquired the name of the "Old Buffs." This regiment has the exclusive privilege of marching through the city of London by beat of drum. Its uniform is red, with buff facings; buff waistcoats and breeches. The 31st regiment, which has the same uniform, is commonly called the "Young Buffs."

The fourth, or king's own regiment of foot, was raised in the year 1685, by Thomas earl of Plymouth. This regiment was the first that joined king William on his landing at Torbay; on which occasion his majesty honoured it with the title of the king's own regiment; and directed it to bear in its colours the lion of England, which still continues the badge of the regiment, and is worn on the breast-plate, buttons, cap, and pouch. The uniform of the regiment, at the beginning of the last century, was red, faced with blue velvet, and large velvet cuffs, richly embroidered with gold. The present uniform is red, with plain blue facings, silver buttons and epaulet, white waistcoat and breeches. On the epaulet, buttons, and breast-plate, are the crown and garter, and round the latter "The King's own Infantry." In the centre is the lion of England, and under it the number 1 in small Roman figures.

The fifth regiment of foot was raised by James II. but it followed the fortunes of the prince of Orange. When the 4th, 5th, and 6th regiments were first raised, they were not placed upon the British establishment, but sent by James II. for the service of the flate-generals. On the abdication of that monarch, and the subsequent election of William, prince of Orange, they were numbered and taken into the line, according to the periods at which they landed from Holland. Thus the 4th, which had originally been raised after the 5th, arrived in England before it, and took precedence. The 6th, which had been levied before the 5th, returned at a later period than either, and was consequently placed according to that date. The 5th regiment has been augmented to two battalions, by drafts from the militia; its uniform going green facings. The 24th, 54th, and 65th regiments are also faced with light green.

The sixth regiment of foot derives its origin from the seven years' war, in the course of which the United Provinces of Holland threw off their subjection to Spain. Its regular establishment did not take place until the year 1673; but it had previously served under the three first princes of Orange. This was one of the three regiments intended, on their formation, to serve in Holland; and, therefore, it was paid by the Dutch republic. It came over to this country with king William, at the revolution in 1688, and was incorporated in our military establishment, being numbered as the 6th in the British line. Its uniform is deep yellow facings, white lace, with yellow and red stripes. The 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 20th, 21st, 22nd, 23rd, 28th, 29th, 30th, 31st, 32nd, 33rd, 37th, 38th, 44th, 45th, 46th, 57th, 62d, and 67th regiments have also yellow facings and white lace; and are distinguished from each other by the variations of the stripes, the tinge of the colour, &c.

The seventh regiment of foot, or "Royal Fusiliers," was raised, with nine others of infantry, and eight of cavalry, under James II. in the year 1685, three years before his abdication. As a fusilier regiment, the men wear caps, similar to those of the grenadiers, but somewhat shorter. In all other respects they are disciplined and appointed as the soldiers of other battalions. Three years after this, another regiment was raised, under the denomination of "Royal Welch Fusiliers." This partiality for cap regiments is said to have been caused by the celebrity of the British grenadiers, who were easily distinguished by their caps. (By a regulation in 1800, all the regiments of the line, as well as the guards, are to wear a kind of caps.) The officers in these regiments never carried spontoons, as the others did, till the latter change; but had busbies, like the officers of the flank companies throughout the army. The other regiments of fusiliers have second lieutenants, instead of ensigns. This regiment is peculiar in having none but first lieutenants, under the field-officers and captains. The uniform is royal blue facings, with white lace, and a blue stripe. The 8th, 15th, 16th, 21st, 23rd, 45th, and 65th regiments have also blue or royal facings, but different lace.

The sixth, or king's regiment of dragoons, was raised and entered on the establishment on the 6th of June 1685. The establishment of this regiment, called, during its services in Germany in the course of the seven years' war, "Bland's dragoons," from the name of the officer who was then at the head of it, is ten troops, each consisting of one captain, one lieutenant, one cornet, one quarter-master, four sergeants, four corporals, one trumpeter, and seventy-one rank and file. The average height of the men is 5 feet 10 inches; of the horses, 15 hands 1/2 inch. The uniform of the officers is scarlet and gold lace, blue cuffs and collar; no facings on the ordinary uniform. The uniform of the troopers, red jacket, faced half-lappel, blue, white lace, buttons marked k. d. g. The sergeant wear gold lace. The second, or queen's dragoon-guards, is one of the eight cavalry regiments raised in 1685, the second year after the accession of king James II. to the throne. Five of these remain on the English establishment, and three on the Irish: of the former five, three are distinguished as "Dragoon-guards," the other two as "Dragoons;" the first of which is denominated the "king's own regiment." The uniform of the officers red, faced with black velvet and silver lace; and that of the troopers red jacket, black collar and cuffs, royal lace, white buttons, marked k. d. g. The sergeant wear silver lace. The third, or prince of Wales's dragoon-guards, is the last of the three regiments distinguished as dragoon-guards upon the British establishment. The uniform is scarlet, faced with white, and yellow buttons. The fourth, or royal Irish regiment of dragoon-guards, was raised, with seven others of the cavalry, in the year 1685, soon after James II. ascended the throne. It was originally called the "Prince of Wales's," or first regiment of horse; and, with the other three of horse upon the same establishment, it was, in the year 1788, put upon a new one, and called "Dragoon-guards," numbering on to seven; so that the fourth of horse, formerly so called, is now the seventh dragoon-guards. The uniform is royal, with silver lace. The fifth regiment of dragoon-guards, commonly called the "Green Horse," was originally the second of horse, and raised in England in the reign of king James II., in the month of July 1685. It was at that time put upon the regular British establishment. It went over with king William to Ireland in 1689, and remained more than 100 years upon the Irish establishment. It is now on the English establishment; and consists of nine troops, of the same strength with those of the fourth regiment of dragoon-guards; each troop consisting of one quarter-master, four sergeants, four corporals, one trumpeter, and seventy-one privates. The uniform of the regiment is green facings with gold lace for the officers, and yellow for the private men. The height of these men is in general from 5 feet 8 inches to 6 feet. The first, or royal regiment of dragoons, was raised for the service of Charles II. in 1683. Their badge is a horse-shoe, including 1 ft. 6 in. circled with a wreath of laurels; the regiment consists of nine troops, of the usual number. The colour of the horses is black. The second,
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meteors are formed, &c. extending from the extremity of the lowest to the tops of the highest mountains.

The upper region commences from the tops of the mountains, and reaches to the utmost limits of the atmosphere. In this reigns a perpetual, equable calmness, clearness, and serenity.

Region, Elementary. See Elementary.

Region, Ethereal, is used for the whole extent of the universe, including the orb of the fixed stars, &c.

Regions of the Sea. As some naturalists, in their descriptions of the subterraneous parts of the globe, distinguish the earth into three regions of different depths, in which different temperatures are observed; so in describing the sea, they allow it two regions; the one extending from the surface of the water, down to low as the rays of the sun can pierce, and extend their influence; and the other, from the lowest bounds of that to the bottom. It is easy to see that these regions rather regard quality than space, and that their boundaries are far from being regular, or equal in all places, and at all times. The places exposed to the hottest sunshine will have the largest upper region; those where the sun has least power will have the smallest; and the same part of the sea will have its upper region more or less deep, according to the season of the year. This upper region of the sea is always more or less hot; the lower region, except in some few particular places, is everywhere warm; and the water, where the upper region is large, is always remarkably still and quiet in the lower. Boyle of Cosmical Qualities.

Region, Subterranean. The earth is not only divided on its surface into regions and countries, but philosophers, who have had occasion to discourse of its inner parts, have also divided them into three distinct regions, according to their different depths from the surface. The temperature of the subterraneous parts of the globe is distinguished according to the division of these regions, but is not so regular and precise as those have supposed. The first region of the earth is very variable, both as to bounds and temperature. The second region seems for the most part cold, in comparison of the other two; but in several places, which, by reason of their distance from the surface of the earth, it would be natural to call the middle region, the temperature of the air is very different at the same fea-coasts of the year, which shows that it depends on something more than bare depth from the surface. The third region of the earth is universally observed to be warm, but by no means regularly or uniformly; the same depth in some places, giving only a moderate warmth, while in others it gives a very considerable heat.

Barrichius tells us of a certain abbe, fond of chemistry, and particularly curious in the matter of long digestions by regular heat, who found a way of making a furnace perpetually warm, by piercing the earth to a certain depth, and using the heat of this third region of it. His method, we are told, was to bore a hole with a pipe twenty feet deep, and pour into it ten or twelve pounds of quicksilver; this made its way into the strata, and through them in a body into the chambers of heat in this third region, where the heat, having a vent upwards, made by this opening, never failed to ascend in a perpetual and regular stream, and gave that regular and digelling heat that no artificial fire could equal. But this is an alchemical story. Boyle of Cosmical Qualities. Barrich de Ortu Chem.

Region, in ancient Rome, a part or division of the city. Romulus divided his little city into three tribes, and Servins Tullius added a fourth; which division continued till Augustus's time, who first divided the city into fourteen regions, or rather divisions by lot. These fourteen regions contained 424 streets, 31 of which were called great or royal streets, which began at the gilt pillar that stood at the entrance into the open place in the middle of the city.

The extent of these divisions varied greatly, some being from 12,000 or 13,000 to 33,000 feet and upwards in circumference. Authors, however, are not agreed as to the exact limits of each.

According to Kennet, who formed his division on the authority of the accurate Panvinius, the different regions were as follow: The first region, called "Porta Capena," contained 9 streets, 3 luci, or concreted groves, 4 temples, 6 ades, or sacred buildings, 6 public baths, 4 arches, 14 granaries, 12 mills for grinding corn, and 121 domes, or great houses. The whole compass of this region, or ward, was 13,223 feet. The second region, denominated "Colomontium," included 12 streets, 2 luci, 5 temples, the public baths of the city, 80 private baths, the great fountains, 23 granaries, 23 mills, and 153 great houses. Its compass was 13,000 feet. The third region, or Ais and Serapis, contained 8 streets, 2 temples, the amphitheatre of Vepfian, the baths of Titus, Trajan, and Philip, 19, or, as some say, 29 granaries, 23 mills, 160 great houses. Its compass was 12,450 feet. The fourth region, Via Sacra, or Tempulum Pacis, comprehended 8 streets, 10 temples, the colossus of the fun, 120 feet high, the arches of Titus, Severus, and Constatine, 75 private baths, 18 granaries, 21 mills, and 138 great houses. Its compass, according to some, was only 8000, but, according to others, 14,000 feet. The fifth region, or Efiguina, included 15 streets, 8 luci, 6 temples, 5 ades, 75 public baths, 18 granaries, 22 mills, and 180 great houses. Its compass was 15,050 feet. The sixth region, Aeta Semita, contained 12 or 13 streets, 15 temples, 2 porticoes, 2 circi, 2 fora, 75 private baths, 19 granaries, 23 mills, and 155 great houses. Its compass was 15,600 feet. The seventh region, Via Latina, included 40 streets, 4 temples, 75 private baths, 3 arches, 17 mills, 25 granaries, and 120 great houses. Its compass was 23,700 feet. The eighth region, Forum Romanum, included 12 streets, 21 temples, 66 private baths, 10 ades, 9 porticoes, 4 arches, 7 fora, 4 baths, 123 basilicas, 66 columns, 18 granaries, 30 mills, and 150 great houses. Its compass was 14,876 feet. The ninth region, Circus Flaminius, comprehended 20 streets, 8 temples, 20 porticoes, 2 circi, 4 theatres, 3 basilicas, 2 curiae, 5 baths, 2 arches, 2 columns, 32 mills, 32 granaries, and 189 great houses. Its compass was 30,500 feet. The tenth region, Palatium, contained 7 streets, 10 temples, 9 ades, 1 theatre, 4 curiae, 15 private baths, 12 mills, 16 granaries, and 109 great houses. Its compass was 11,600 feet. The eleventh region, Circus Maximus, included 8 streets, 22 ades, 15 private baths, 16 granaries, 12 mills, and 189 great houses. Its compass was 11,450 feet. The twelfth region, Piscina Publica, contained 12 streets, 22 ades, 68 private baths, 28 granaries, 25 mills, and 128 great houses. Its compass was 12,000 feet. The thirteenth region, Aventinus, included 17 streets, 6 luci, 6 temples, 74 private baths, 36 granaries, 30 mills, and 155 great houses. Its compass was 16,300 feet. The fourteenth region, Trastiberina, contained 23 streets, 6 ades, 136 private baths, 20 granaries, 32 mills, and 150 great houses. Its compass was 33,409 feet.

REGIONARY, Regionarius, in Ecclesiastical History, a title given, from the fifth century, to persons who had the charge and administration of the church affairs within a certain district or region.

At Rome there were anciently seven regionary deacons, who
who presided over a kind of hospitals; and looked to the distribution of alms.

There were also regional subdeacons, and regional notaries, as also regional bishops, &c.

A regional bishop was properly a missionary invested with an episcopal character, but without being attached to any particular fee, that he might be at liberty to go to preach, and perform other functions of his ministry, whether or no the Spirit of God and the wants of the people should call him.

REGIS, Peter Sylvan, in Biography, a celebrated French philosopher, was born at Salvetat de Blanquefort, in the Agenois, in the year 1632. After having been instructed in classical learning and the belles lettres, by the Jefuits, at Cahors, he entered himself a fludent of divinity at the university of that city, intending to qualify himself for the clerical profession. This, however, he abandoned, in order to devote himself to the study of the Cartesian philosophy, which at that time was taught with great success by Rohault. With this view he went to Toulouse in 1653, and read a course of lectures upon the principles of Descartes, and was attended by persons of all ranks and characters, who inlisted themselves in the number of his disciples. Among these were to be found the magistrates, clergy, and even the women of Toulouse, who affected to be the zealous converts to the new philosophy, in opposition to the old.

To express their gratitude to the man who had been the instrument of diffusing this light over their city, the inhabitants granted him a pension; a circumstance which, it has been observed, corresponded more with the spirit and usages of ancient Greece, than of modern times. In 1680 he came to Paris, considering that as the most proper scene for the exhibition of his talents. Here he was extremely popular, and the friends to the Aristotelian systen began to be alarmed at his success, and complained against him to the archbishop of Paris, who prohibited him from continuing his lectures, and they were accordingly suspended. But after a short time, the prel ate withdrew his interdict, and Regis devoted the remainder of his life to the propagation of the Cartesian philosophy, as well by his writings as his lectures. In 1699 he was admitted a member of the Academy of Sciences, but his infirmities prevented him from attending its meetings. He died in the year 1707, at the age of 75, highly esteemed by persons of the first distinction for talents and rank. He was author of a great number of works, of which the following may be mentioned: "A Systen of Philo sophy, containing Logie, Metaphysics, and Morals;" "An Answer to the Book of M. Huet, entitled 'Cenflura Philosophiae Cartesiana;'" which is mentioned by Bayle as a model for every writer on the same side of the question: "An Answer to the Critical Reflections of Du Hamel on the Systen of Philosophy;"

REGIS, in Geography, a town of Saxony, in the bishopric of Nuremberg; 14 miles S. of Leipzig.

REGIS, St., a village of Upper Canada, on the St. Lawrence, half a mile N. from the N. line of the United States. It is seated on a beautiful elevated plain, in the angle between the mouth of St. Regis river and the St. Lawrence. It consists of about 80 houses of hewn logs, inhabited by about 100 Indian families of the Caghnawaga tribe, who have lived here more than half a century. They are peaceable, honest, and industrious. Their diversions are foot races, playing at ball, and dancing. They are Roman Catholics, and have a handsome stone church, with a spire, and generally a minster. These Indians have 30,000 acres of land referred to them S. of the village. They keep a great number of horses and cattle, and raise plenty of corn on the fertile islands in St. Lawrence. From St. Regis there is a good road to Plattburg, on Champlain; the distance being 72 miles.—Alto, a river of Canada, which rises from lakes near Racket river, and enters the St. Lawrence at the village above-mentioned.

REGIS Pan. See Pondus.

REGIS Villa. See Villa.

REGISTAN, or Sandy Desert of Agimere, in Geography, a sandy desert, forming the western boundary of Hindostan, between the country of Agimere and the Indus. The northern extreme of this desert bounds the dominions of the Sciks on the south.

REGISTER, Registerum, a public book serving to enter and record memoirs, acts, and minutes, to be had recourse to occasionally, for the justifying of matters of fact. Mercere derives the word, by corruption, from regelsum, a book containing extracts of several books, &c. collected together: "Dietur regelsum quasi iterum ledum." Others derive it from the old French gift, to lie down in a bed, &c.

The law of Scotland is rendered very easy and regular, by means of the great number of registers, for recording the conveyances of lands, &c. of private persons. Of these there are two kinds: the one general, fixed at Edinburgh, under the direction of the lord register, who, before the Union, was the fifth officer of the state, and, besides the regisy, was clerk of the parliament, treasury, exchequer, and sefion.

The other is particularly kept in the several shires, counties, and regalities. The clerks of it are obliged to transcribe the registers of their respective courts to the general register; and the notaries' protocols: and here they are so disposed, that, on demand, the lieges can have a view of any writs which the law requires to be registered, or which parties, for their security, have thought fit to record.

The registers were first set on foot by act of parliament, under king James VI., to the unfeupkable advantage of the subject.

No man can have a right to any estate, but it must be registered within forty days of its becoming feised of it, otherwise it is null; and by this means all secret conveyances are cut off.

By a law in 1704, it was enacted, that a memorial of all deeds and conveyances, and of all wills and devises in writing, by which any honours, manors, &c. in the West Riding of Yorkshire, might be any way affected in law or equity, may, at the election of the party or parties concerned, be registered: and that, after such register, every subsequent deed or conveyance of the said honours, manors, &c. fo registered, or any part of it, shall be adjudged fraudulent and void, unless a memorial of it shall be also registered: and the like of wills, &c. But this act did not extend to copyhold estates, nor to leases at rack-rent, nor to any lease not exceeding twenty-one years.

In the year 1705, a similar statute was passed for the registering of deeds, conveyances, wills, devises, mortgages, &c. in the East Riding of Yorkshire: and all the provisions and clauses in this act were hereby extended to the honours, manors, lands, and tenements, in the West Riding of the same county.

In 1709, a law was made for the public registering of deeds, conveyances, wills, &c. in the county of Middlesex; which may be done for the fee of one shilling: and every deed or conveyance, which shall hereafter be executed, shall be adjudged fraudulent and void, against any subsequent purchaser or mortgagee for valuable consideration, unless such memorial of it be registered according to the direction of
of this act, before the registering of the memorial of the deed or conveyance, under which such subsequent purchaser or mortgagee shall claim; and the like as to memorials of wills not registered.

In 1735, a similar register of mortgages, &c. was legally enacted for the North Riding of the county of York; whence York and Middlesex are register counties. (2 & 3 Ann. cap. 4. 6 Ann. cap. 5. 7 Ann. cap. 20. 8 Geo. II. cap. 6.) Those statutes do not extend to copyhold estates, leaves at a rack-rent, or to any offices not exceeding 21 years, where the pofsession goes with the leaf; nor to any chambers in the inns of court.

Many have wished that the same regulation was extended to all the counties of England and Wales; but judge Blackstone observes, that, however plausible these provisions may appear in theory, it hath been doubted, by very competent judges, whether more disputes have not arisen in those counties, by the inattention and omission of parties, than prevented by the use of registers.

Register, more correctly Registrer, Registrarius, is also used for the clerk, or keeper of a register, or registry.

Of these we have several, denominated from the registers they keep; as register of the high court of delegates, registers of the arches court of Canterbury, register of the court of admiralty, register of the prerogative court, registers of the province of Canterbury, register of the archdeaconry of Middlesex, &c. register of the faculty office, and register of the garter, who is always dean of Windsor, and deputy registers.

There are also, in the court of chancery, the principal register, the lord chancellor's registers, the registers of the matter of the rolls, entering registers, and register of the affidavits.

The appellation of register or registrarius is also given to a notary. See Notary, and Notary, Public.

Register. City. See Town-Clerk.

Register of a parish church, is a book in which the yearly baptisms, marriages, and burials, of each parish, are orderly registered. See Marriage.

This practice was laudably instituted by that great but unfortunate perfon Thomas Cromwell, earl of Essex, anno 1538, while he was vicar-general to king Henry VIII.; and it was continued in the reigns of king Edward VI. and of queen Elizabeth.

These parish registers are to be kept in a coffer, provided by the churchwardens, with three locks and keys, one of which is to remain with the minister, and the other two with the churchwardens severally, so that neither the minister without the two churchwardens, nor the churchwardens without the minister, shall at any time take that book out of the said coffer. These parish registers are to be subscribed by the minister and churchwardens; and the names of the persons shall be transmitted yearly to the bishop; and it has been enforced by canon 70, and by statute, &c.

By 26 Geo. II. c. 33: to make a false entry in a marriage register, to alter it when made, to forge or counterfeit such entry or a marriage licence, or aid and abet such forgery, to utter the name as true knowing it to be counterfeit, or to destroy or procure the destruction of any register, in order to vacate any marriage, or subject any person to the penalties of this act; all these offences, knowingly and wilfully committed, subject the party to the guilt of felony, without benefit of clergy.

By the 30 C. II. c. 5: for burying in woollen, it is enacted, that the minister of every parish shall keep a register in a book to be provided at the charge of the parish, and make a true entry of all burials within his parish, and of all affidavits of persons being buried in woollen brought unto him according to the said act; and where no such affidavit shall be brought to him within the time therein limited, he shall enter a memorial thereof in the said register, against the name of the party interred, and of the time when he notified the same to the churchwardens or overseers of the poor according to the said act.

An approved register of births, confisting of certificates signed by two persons who were present at the birth, and entered in a book signed by the regifterer or secretary, is kept with great accuracy, and authenticated by a committee, for the benefit of Protestant dissenters and others. This book is deposited and carefully preserved at Dr. Williams's library, Red-cros Street, Cripplegate, to which any person may have free access at the stated hours, under the direction of the secretary of the said library, whole attention to his office entitles him to public respect.

Register is also a title of a book, containing the forms of most of the writs, original and judicial, used in common law. This is called the register of writs, or registerum omnium brevium. This register, Coke on Littleton observes, is one of the most ancient books of the common law. And judge Blackstone observes concerning it, that it is the most ancient and highly venerable collection of legal forms, upon which Fitzherbert's Natura Brevium is a comment, and in which every man, who is injured, will be sure to find a method of relief, exactly adapted to his own case, described in the compass of a few lines, and yet without the omission of any material circumstance.

Register, in Antiquity, a book or table at Athens, belonging to each particular χρονος, or ward, in which all fathers were obliged to enrol their sons, making oath, at the same time, that every son, so registered, was either born to them in lawful wedlock, or lawfully adopted. The adopted sons were registered in the festival Thargelia; the natural, upon the third day of the festival Apaturia.

At what age children were thus registered is not agreed. Some are of opinion, that at every return of the Apaturia it was customary to register all the children that had been born that year. Others affirm, that they were commonly three or four years old before they were registered.

There were two other feasons when young Athenians were enrolled in a public register: one, when they arrived at the age of eighteen years, and were admitted into the number of the αρχειον, and was performed on the third day of the festival Apaturia; and the other, before the festival Panathenea, when those who were twenty years old were entered in a register, called Κηριωδτη τοιαυτων, in which the names of all persons of that borough, who were of age to succeed in the αρχεια, or inheritance of their fathers, were entered. This was termed to be registered among the men; and the persons, thus enrolled, became their own masters, and free from the government of their guardians. Potter's Arch. Graec. vol. i. p. 48.

Registers of Estates, the accounts of particular things which belong to them, as those of rentals, valuations of fields, names, admeasurements, different portions of land, cottages, and other buildings distinct from the farms, and any other separate parts. In these registers the valuations are to be entered in columns, as they arise from surveys or other ways, and afford the means of fixing the real values in re-letting the lands or for other purposes.

Also, a general register of the timber trees which are growing on the several divisions of the estates, should always be kept; in which the number contained in each separate wood, grove, hedge-row, or any other part, must be entered,
tered, with their kinds, and the admeasurement of each, for the use of the proprietor and wood managers.

A great many other sorts of particulars regarding the estates may likewise be usefully and conveniently put down in these registers.

Register of Seamen. See MANNING the Fleet.

Register Ships, or Ships of Register, in Commerce, were vessels to which the king of Spain, or the council of the Indies, granted permission to go and trade in the ports of Spanish America.

They were thus called, because the ships were to be registered before they set sail from Cadiz, which was the place where they usually loaded for Buenos Ayres.

These vessels, by the tenor of the edict, were not to exceed three hundred tons; but the president of the council of the Indies, for which they paid a very high premium, and were defined for those ports where any extraordinary demand was foreseen or expected. In proportion as experience manifested the advantages of carrying on trade in this mode, the number of register ships increased, and at length, in the year 1748, the galleons, after having been employed upwards of two centuries, were finally laid aside. From that period there has been no intercourse with Chili and Peru, but by single ships dispatched from time to time, as occasion requires, and when the merchants expect a market will open. These sail round Cape Horn, and convey directly to the ports in the South sea the productions and manufactures of Europe, for which the people settled in these countries were formerly obliged to repair to Porto Bello or Panama.

But as all the register ships defined for the South seas were obliged to take their departure from Cadiz, and were under a necessity of returning thither, this branch of the American commerce, even in its new and improved form, continued subject to the restraints of a species of monopoly, and felt its pernicious effects.

The intercourse between Spain and her colonies has in later times been much improved and facilitated. In the year 1765, Charles III. appointed packet-boats to be dispatched on the first day of each month from Corunna to the Havanna or Porto Rico. From thence letters are conveyed in smaller vessels to Vera Cruz and Porto Bello, and transmitted by post through the kingdom of Tierra Firme, Granada, Peru, and New Spain. Packet-boats also sail with the same regularity, once in two months, to Rio de la Plata, for the accommodation of the provinces to the east of the Andes.

With this new arrangement for facilitating intercourse a scheme of extending commerce has been more immediately connected. Each of the packet-boats, which are vessels of some considerable burden, is allowed to take in a loading of such commodities as are the product of Spain, and may demand in the ports whither they are bound. In return for those, they may bring home to Corunna an equal quantity of American productions. This regulation may be considered as the first relaxation of those rigid laws, which confined the trade with the new world to a single port, and the first attempt to admit the relit of the kingdom to some share in it. This measure of relaxation was soon followed by another more decisive. In the year 1765, Charles III. laid open the trade to the windward islands, Cuba, Hispaniola, Porto Rico, Margarita, and Trinidad, to his subjects in every province of Spain. This ample privilege was soon after extended to Louisiana, and to the provinces of Yucatan and Campeachy. As soon as this general liberty was permitted, it produced the most beneficial effects: and it has been computed, that such a number of ships was soon employed in the free trade, that the tonnage of them far exceeded that of the galleons and flota, at the most flourishing era of their commerce. This arrangement extended its good effects through every province of the kingdom; and by opening a new market for their various productions and manufactures, encouraged and added avidity to the industry of the farmer and artificer. Spain has also permitted a free trade between the colonies themselves. In the year 1774 Charles III. published an edit, granting to Peru, New Spain, Guatemala, and Granada, the privilege of a free trade with each other. See Roberton’s Hist. of America, vol. iii.

Register, among Letter Founders, is one of the inner parts of the mould in which the printing types are cast. Its use is to direct the joining of them partly together again, after opening them to take out the new-cast letters.

Register, in Printing, the disposing of the forms of the press, so as that the lines and pages printed on one side of the sheet meet exactly against those on the other; which is done by means of a point or outward tympan.

Register, in Organ-building, is another word for a flop in that instrument; but is in fact only a board pierced with holes, corresponding with those in the found-board, which by drawing out the flots opens the holes, and putting them in the flots. These flotspeaks or stake is filent. Register is figuratively used by musicians in speaking of a voice, in which real and false notes are not well united. Mr. Braham’s high notes, for example, are said to be of a different register from the low.

Registers, in Chemistry, are holes, or chinks, with flotspeaks to them, contrived in the sides of furnaces, to regulate the fire; i.e. to make the heat immediately more intense, or remit, by opening them to let in the air, or keeping them close to exclude it. See Fire-places and Furnace.

REGISTRY, Register, comprehends the office, books, and rolls, in which the proceedings of chancery, or any spiritual court, are registered or recorded.

REGISTRY of Shipping, in Commerce. The regisiting of ships appears to have been first introduced into this country by the Navigation Act, 12 Car. II. c. 18. § 10. By this statute, however, foreign ships only, “British owned,” were required to be registered. By Art. 7 & 8 W. III. c. 22. § 17, British or plantation built ships, British owned, if intended to be employed in the plantation trade, and also all “prize ships,” were required to be registered; and in consequence of a regulation at the admiralty, ships for which Mediterranean passes were wanted, were also to be registered. The provisions in the acts requiring registry are founded upon the writs policy, and are not only calculated to prevent the commision of private fraud upon individuals, than to advance the public policy of the state. By Art. 26 Geo. III. c. 60. (lord Hawkebury’s act), no ship or vessel foreign built (except such as have been condemned as lawful prize in any court of admiralty), nor any ships or vessels built or rebuilt upon any foreign made keel or bottom, although owned by British subjects, and navigated according
REGISTRY.

according to law, shall be entitled to the privileges of a British built ship, or of a ship owned by British subjects, and all the privileges and advantages allowed shall be confined to such ships only as are wholly of the built of Great Britain or Ireland, Guernsey, Jersey, and the Isle of Man, or some of the plantations in Africa, or America, now belonging to or which may hereafter belong to his majesty, except such foreign built vessels as before the 18th of May 1786 did truly and wholly belong to British subjects, navigated according to law, and duly registered, which shall continue to enjoy the privileges to which such ship or vessel is by law entitled; nor shall this act prevent any such vessel which may have been begun to be repaired or rebuilt before the 18th of May 1786 from being registered, provided it shall appear upon oath, to the satisfaction of the commissioners of the customs, that such vessel was stranded by the act of Providence, and was at the time of being stranded the sole property of some foreigner, or a right of the admiralty; and if it shall appear that such vessel, from the damage received, was rendered unfit to proceed to sea without undergoing a thorough repair in this kingdom, and that she was necessarily sold for the benefit of the foreign owners, or under an order or commission from the court of admiralty, and that she was fairly and openly purchased by a British subject, and being the sole and entire property of such British subject, that she had been so much repaired, that two-thirds of her at least are of British built, she may be registered.  f. 1.

No vessel shall be deemed British built, or enjoy the privileges belonging to British built vessels, which shall be rebuilt or repaired in any foreign port, if such repairs shall exceed 15s. for every ton, unless such repairs shall be rendered necessary by extraordinary damage, and absolutely necessary to enable her to perform the voyage, and to return in safety to some place or port within his majesty’s dominions; and before such vessel shall be so repaired, the master shall report her state, and condition upon oath to the British consul or other chief officer at the port where such repairs may be necessary, and cause the same to be surveyed by two persons to be approved of by such consul or chief British officer, and shall deliver to such consul or officer, in writing, the particulars of the damage sustained, and verify upon oath the particulars and amount of the repairs, and that the same were become necessary in consequence of damage sustained during her voyage, to enable the same vessel to prosecute her intended voyage, and to return to some port within his majesty’s dominions, which must be certified under the hand and seal of the chief consul or other officer; or if no such consul, &c. shall be there resident, the survey shall be made by two persons to be approved of by two known British merchants residing at or near such port. And the master of such ship shall produce to such merchants vouchers of the particulars and amount of the repairs, and their certificate shall be of the fame effect as that of the British consul or chief officer. And the masters of vessels repaired in any foreign port shall make oath before the collector and comptroller, or other principal officer of the customs in the first port of arrival (if required so to do), describing the nature and amount of such repairs; and if such expense shall exceed 15s. per ton, and the master or commander of such ship shall neglect or refuse to deliver to such collector or comptroller, or other principal officer of the customs, the certificate by this act required to be produced, such vessels shall to all intents and purposes be deemed foreign built.  f. 2.

Ships above 15 tons British owned shall be registered in the manner hereinafter mentioned, and the person claim-
REGISTRY.

admeasurement, the remainder will be the ship's extreme length, from which are to be deducted three inches for every foot of the load draught of water for the rake abaft, and also three-fifths of the ship's breadth for the rake forward; the remainder shall be deemed the just length of the keel to find the tonnage; and the breadth shall be taken from outide to outide of the plank in the broadest part of the ship, either above or below the main-wales, exclusive of all manner of sheathing or doubling, that may be wrought upon the side of the ship; then multiplying the length of the keel for tonnage by the breadth so taken, and that product by half the breadth, and dividing by 94, the quotient shall be deemed the true contents of the tonnage. Nothing in this act to be construed to alter the manner of admeasuring the tonnage of any ship which has heretofore been practised for the purpose of ascertaining the light duties, or any other duties or imposts payable according to the tonnage of any vessel. f. 14.

At the time of obtaining the certificate of registry, bonds shall be given to his majesty by the master, and such of the owners who shall attend, in the following penalties:

If a decked vessel, or from 15 to 50 tons, 1,000l; 50 to 100 tons, 5,000l; 100 to 200 tons, 50,000l; 200 to 300 tons, 100,000l; and upwards, 1,000l.

The condition of every bond given upon registry shall be that such certificate shall not be sold, lent, or otherwise disposed of to any person or persons whomsoever, and that the same shall be solely used for the service of the ship or vessel for which it was granted; and that in case such vessel shall be taken by the enemy, burned or broken up, or otherwise prevented from returning to the port to which it belongs, the certificate, if preferred, shall be delivered up within one month after the arrival of the master in any port or place in his majesty's dominions, to the collector or comptroller of some port in Great Britain, or the Isle of Man, or of the British plantations, or to the governor, lieutenant-governor, or commander-in-chief for the time being, of the islands of Guernsey or Jersey; and that if any foreigner, or any person or persons for his use and benefit, shall purchase, or otherwise become entitled to the whole or any part or share of, or any interest in such vessel, and the same shall be within the limits of any port in Great Britain, Guernsey, Jersey, Man, or the British colonies, plantations, islands, or territories aforesaid, then in such case the certificate of registry shall, within seven days after such purchase or transfer of property in such ship or vessel, be delivered up to the person or persons authorized by this act to make registry and grant certificates thereof at such port and place respectively; and if such ship or vessel shall be in any foreign port when such purchase or transfer shall take place, then that the same shall be delivered up to the British confid or other chief British officer resident at or nearest to such foreign port; or if such vessel shall be at sea, at the time of such transfer of interest and property, then the said certificate of registry shall be delivered up to the British confid or other chief British officer at the foreign port or place in or at which the master or other person having or taking the command of such ship or vessel shall first arrive after such purchase or transfer of property at sea, immediately after his arrival at such foreign port; but if such master aforesaid mentioned in the case above-mentioned shall not arrive at a foreign port, but shall arrive at some port of Great Britain, Guernsey, Jersey, Man, or his majesty's said colonies, plantations, islands, or territories, then the said certificate shall be delivered up in manner above-mentioned, within 14 days after the arrival of such ship or vessel, of the person who had the command thereof, in any port of Guernsey, Jersey, Man, or any of his majesty's said colonies, plantations, islands, or territories. And if any pais, called a Mediterranean pais, shall have been obtained and procured by any such ship or vessel, and in such case the same shall be delivered up at the same time, and in like manner with the certificate of registry, to the persons hereinafter authorized to receive such certificate of registry: and such certificates so delivered up, shall be transmitted forthwith to the commissioners of the customs in England and Scotland respectively; and such Mediterranean pales shall also be transmitted to the admiralty of Great Britain, by the person or persons authorized to receive such certificate and pales, that the same may be cancelled. f. 15.

In case of any alteration of property in the same port by the sale of any shares in any ship or vessel after registering thereof, such sale or transfer of property shall always be acknowledged by indorsement in the certificate of registry, before two witnesses, in order to prove that the entire property in such ship is vested in some of the subjects of Great Britain. In case any dispute should arise concerning the same, the above indorsement to be signed by the person transferring the property in such ship or vessel, or by some person legally authorized for that purpose.

As &c. 7 & 8 W. III. c. 22; 24 Geo. III. c. 68. f. 15.

In addition to the above indorsement there shall also be indorsed on the certificate of registry, before two witnesses, the town, place, or parish, where all persons to whom the property in any ship or vessel shall be transferred shall reside; or if such persons usually reside abroad, but in some British factory, then the name of such factory of which such persons are members; or if such persons reside in any foreign town or city, the name of such foreign town or city, and also the names of the house or copartnerhip in Great Britain or Ireland for or with whom such are agents or partners; and the person to whom the property of such ship or vessel shall be so transferred, or his agent, shall deliver a copy of such indorsement to the person authorized to make the registry, who is to cause an entry to be indorsed on the oath or affidavit upon which the original certificate of registry of such ship or vessel was obtained; and also to make a memorandum in the book of registrars, and forthwith give notice to the commissioners of the customs in England or Scotland, under whom they respectively act.

The certificate of registry of such vessel shall be recited in words at length in the bill or instrument of sale thereof, otherwise such bill of sale shall be utterly void. f. 17.

As often as the master or commander of any registered vessel shall be changed, the master or owner thereof shall deliver to the person authorized to make such registry at the port where such change shall take place, the certificate of registry belonging to such ship or vessel, who shall indorse and subscribe a memorandum of such change, and shall give notice to the proper officer of the port where such ship or vessel was last registered; who shall likewise make a memorandum of the same in the register book, and give notice to the commissioners of the customs in England and Scotland. f. 18.

No owner of any ship or vessel shall be permitted to give any other name thereto than that by which she was first registered. And all owners of registered vessels shall, within one month from the registry, paint in white or yellow letters, of a length not less than four inches, upon a black ground, on some conspicuous part of the stern (provided there shall be sufficient space, but if not, then in letters as large as such space will admit), the name by which such ship or vessel shall have been registered, and the port to which
which she belongs, and so keep and preserve the same. And if such owner, or master or commander of such ship or vessel shall willfully alter, erase, or conceal, or permit the same to be done, unless in the case of square rigged vessels in time of war, or shall in any written or printed paper describe such ship by any other name than that by which she was first registered, or shall verbally describe such ship or vessel by any other name to any officer of the revenue in the due execution of his duty, such owner or commander thereof shall forfeit the sum of 100l. f. 19.

By 26 Geo. III. c. 60, all persons who shall apply for a certificate of registry in Great Britain, Guernsey, Jersey, or the Isle of Man, for any ship which shall be built, or whose building shall be completed after the 1st of August 1756, shall produce to the person authorized to grant such certificate a true account under the hand of the builder of the same, of the proper denomination, the time when, and the place where such ship or vessel was built, and an exact account of the tonnage, together with the name of the first purchaser; and also make oath before the person authorized to grant such certificate, that the ship or vessel for which such certificate is required is the same with that so described by the builder. And every person applying for a like certificate in any of his majesty’s colonies, plantations, or territories, shall, before such certificate is granted, produce the like account, under the builder’s hand, and take the like oath as is required to be produced and taken by persons applying in Great Britain. f. 20, 21.

If any certificate of registry shall have been lost, a register and certificate de novo, in the form herein directed, shall be granted for such vessel, according to 15 Geo. II. c. 31; but in all such cases such security shall be given as is directed in this act, and in lieu of the oath prescribed by 15 Geo. II. the like oath shall be taken and subscribed as hereinbefore directed, by the owner or owners of such ships and vessels as are required to be registered by this act. f. 22, 23.

If any ship or vessel shall, after registry, be altered, either in form or burthen, or in any manner whatsoever, such ship or vessel shall be registered de novo as soon as the returns to her port, or to any other port in which she may be registered by virtue of this act; or failure whereof such ship or vessel shall be considered as a foreign vessel. f. 24.

The owners of all such ships as shall be condemned as lawful prize, shall, upon registry thereof, before any certificate of registry shall be obtained, produce to the proper officer of the customs a certificate of the condemnation of such vessel, and also a true account in writing of all the particulars contained in the certificate herein-before set forth, to be made and subscribed by one or more skilful persons to be appointed by the court to survey such ship or vessel; and shall also make oath before the said officer, that such ship or vessel is the same ship or vessel mentioned in the certificate. f. 25.

No ship condemned as prize shall be registered in the islands of Guernsey, Jersey, or the Isle of Man, although belonging to his majesty’s subjects resident in those islands; but the same shall be registered either at Southampton, Weymouth, Exeter, Plymouth, Falmouth, Liverpool, or Whitehaven, by the collector and comptroller at such port respectively. 26 G. III. c. 60. f. 26.

In all cases where any ship or vessel taken and condemned in any of his majesty’s colonies, plantations, or islands aforesaid, shall be registered, and obtain a certificate, an exact account shall be subjoined thereto of the sum for which such ship or vessel shall have been sold, verified upon the oath of the person applying for such certificate of registry. f. 27.

All certificates, hereafter to be granted in pursuance of this act, shall distinguish whether such ships or vessels be of the built of Great Britain, Guernsey, Jersey, or the Isle of Man, or of the colonies, plantations, islands, or territories aforesaid, or of any foreign country; and shall, if British built, be entitled “Certificate of British plantation registry,” and if foreign built, shall be entitled “Certificate of foreign ship’s registry for the European trade, British property,” as the case may be. f. 28.

No ship or vessel, directed by this act to be registered, shall be permitted, after the first arrival at the port to which she belongs, at the expiration of the notice by this act directed, to clear outwards for foreign parts, or coastwise, or to proceed to sea for the purpose of fishing on the coasts, or for any other purpose, as a British ship or vessel, unless the owners thereof shall have obtained a certificate; and in case such ship or vessel depart from such port without being registered, and without having obtained a certificate, every such ship or vessel, with all her guns, furniture, ammunition, tackle, and apparel, shall be subject to forfeiture. f. 32.

If, after the expiration of the before-mentioned notice, any ship or vessel (being square rigged) shall be found in any port within 20 leagues by water from the port to which she belongs, or if any vessel, not square rigged, be found within any port other than that to which she belongs, without having a certificate of registry hereinafter directed, it shall be lawful for the principal officer of such port, and he is hereby required to detain such until the master or commander shall, if such ship or vessel be under 50 tons, give security by bond in 50l. in manner hereinafter directed; and if the same shall exceed 50 and not exceed 100 tons, shall give security by bond in 100l.; and if the same shall exceed 100 tons, then until the master or commander shall, with one security give bond in 200l., with condition that such master or commander shall forthwith repair with her to the port to which she belongs, and there cause her to be registered, procure a certificate, and deliver to such officer such certificate within the time limited in the condition of such bond; and such time is to be fixed according to the distance of the vessel from the port to which she belongs, and the nature of the voyage in which she may be engaged; and on failure of producing such certificate, such bond shall be forfeited; but if the certificate be produced within the time so limited, such bond shall be void. And in case any square rigged vessel shall be found in port, after the expiration of the aforesaid notice, more than 20 leagues distant by water from the port to which she belongs, or that the water at the entrance of the port to which she belongs shall be so shallow as not to admit her entrance, the master or commander shall, within 48 hours after his arrival at such port, make known his arrival to the collector and comptroller of the customs, or other principal officer of such port; and shall require such collector and comptroller to cause his ship or vessel to be surveyed by the proper officer, who shall accordingly make a perfect survey, and certify the several particulars thereof; and such collector and comptroller shall immediately transmit the said certificate of survey to the person authorized to register ships and vessels at the port to which such vessel belongs, who shall register such vessel, and grant certificate of registry; and it shall be lawful for the collector and comptroller, or other principal officer of the customs, in the port where such ship or vessel shall be so found, to detain her until a perfect and accurate survey, in the manner hereinbefore directed, can be made.

The remaining sections of this act relate to penalties upon
the misconduct of officers, forging or altering certificates of registry, mode of recovering penalties, &c.

By 27 G. III. c. 19. f. 4, no oath taken for the sole purpose of acquiring the rights of a citizen or burgher in any foreign city or town in Europe, to be enjoyed during the time that such person taking such oath shall reside in such city or town, and for a limited time after such residence shall have expired, shall be deemed an oath of allegiance to a foreign state, nor inconsistent with the form of the oath upon registry prescribed by 7 & 8 W. III.

Ships belonging to the East India company, or any other body corporate, are to be registered upon the oath subscribed by the secretary of the said company or other body corporate, or by any other officer properly authorized. f. 7.

No vessel whatsoever, not exceeding the burthen of 30 tons, and not having a whole or fixed deck, and being employed solely in the Newfoundland fisheries, or on the banks or shores of the provinces of Quebec, Nova Scotia, or New Brunswick, adjacent to the gulf of St. Lawrence, and to the north of Cape Cano, or of the islands within the same, or in trading coastwise within the said limits, shall be subject to be registered in pursuance of the said act. f. 8.

Ships built in Newfoundland, and those parts of the provinces of Quebec, Nova Scotia, and New Brunswick, adjacent to the gulf of St. Lawrence, and to the north of Cape Cano, or in the islands within the said limits, on account of owners residing in his majesty's European dominions, shall be registered in the above places, upon the husband or principal agents of the said ships taking the oath required; and such certificates shall be of the same effect as if granted upon the oath of the owners, until such time as they shall arrive in port in any of his majesty's European dominions, where they may be respectively registered upon the oath of the respective owners, but no longer. And whenever such ship shall arrive at any such port in his majesty's European dominions, the certificates of registry, granted in pursuance of this act, shall be null and void, and shall be delivered up to be cancelled; and such ships are hereby required to be respectively registered de novo conformably to the requisitions of the preceding act. f. 9.

By 27 G. III. c. 19. f. 13, all ships not registered according to the directions and regulations of the said act, although such ships may be owned by his majesty's subjects, shall be held and deemed as alien ships, and shall in all cases be liable to such and the same penalties and forfeitures as alien ships are by law liable to in similar cases.

By 34 G. III. c. 42, foreign ships and vessels heretofore owned by subjects of the late French king, which in consequence of any capitulation may be put under his majesty's protection at the time of, or in consequence of the surrender of any foreign colony, may be registered as ships condemned as lawful prize, and shall become entitled to the privileges of British ships, under the regulations and restrictions hereafter mentioned. Provided always, that no ship shall be so registered but upon producing a certificate under the hand and seal of the person who commanded in chief, by sea or land, at the time when such foreign colony was surrendered (or in case of the death or departure of any such officer before such certificate shall have been so given, then upon a like certificate under the hand and seal of the person who shall command in chief, by sea or land, at such colony), certifying that such ship or vessel was put under the protection of his majesty at the said time; and upon oath, hereinafter directed, being taken and subscribed before the person authorized to make such registry, by the owner of such ship, if the belong to one person only; or in case there shall be two joint owners, then by both of such joint owners, if both be resident within 20 miles of the place where such registry is required, or by one of such owners, if one or both of them shall be resident at a greater distance; or if the number of such owners shall exceed two, then by the greater part of them, if the greater number of them shall be resident within 20 miles, not in any case exceeding three of such owners, or by one of such owners, if all shall be resident at a greater distance. Provided that such registry shall, for the island of St. Domingo, be made at the port of Kingston in the island of Jamaica, and for any of the French Leeward islands, in the port of Roseau in the island of Dominica; and the said ports of Kingston and Roseau shall respectively, for the purpose of such registry, be deemed to be the port to which such ship belongs. f. 7.

His majesty, by the advice of his privy council, may at any time, on the arrival of any such ship in Great Britain, upon application made to him, authorize any such ship (without payment of any duty whatever for the said ship, or the fail and other necessary tackle, apparel, and furniture thereof) to be registered, in the case of a prize-ship, in any port of Great Britain. f. 4.

No person heretofore a subject of the late French king, being a white person, a mulatto, or free negro, shall be employed to navigate any vessel bound from any foreign colony, to any part of his majesty's dominions, or be conveyed as a passenger on board thereof, unless such person shall produce a certificate under the hand and seal of the person who commands in chief in such foreign colony, or at the place wherein such ship shall fail, certifying that such person has taken the oath of fidelity and allegiance to his majesty; and no negro-slave belonging to any person whatsoever, heretofore a subject of the late French king, shall be so conveyed or employed, but upon a certificate under the hand and seal of his master (which master shall have taken the oath of fidelity and allegiance as aforesaid), certifying the good character of such negro-slave, and certifying that his conduct has been such that he may be safely admitted into the ports of his majesty's dominions; which certificate shall be endorsed by the person who commands in chief his majesty's troops or vessels at the place from whence such ship shall fail, signifying that he has no reason to doubt of the truth thereof; upon pain that the master or commander of such ship shall forfeit 50l. for every person respectively employed or conveyed in such ship without having such certificate. f. 5.

By 34 G. III. c. 68, no goods, wares, or merchandizes whatever shall, from the expiration of six months after the conclusion of the present war, be imported into, or exported from, any port or place in Great Britain, or Guernsey, Jersey, Alderney, Sark, or Man, to any other port or place of the said, on board any ship or vessel which, by law, is or shall be required to be registered as a British ship or vessel, unless such ship or vessel shall be navigated by a master and three-fourths at least of the mariners British subjects. Nor, from the expiration of six months from the conclusion of the present war, shall any ship or vessel, which by law is or shall be required to be registered as a British ship or vessel, be navigated by a master and three-fourths of the mariners at least British subjects, except as hereinafter provided. f. 1, 2, 3.

No goods, wares, or merchandizes whatever shall be carried from any port in Great Britain, or Guernsey, Jersey, Alderney, Sark, or Man, to any other port or place of the said, nor shall any ship be permitted to fall in ballast from or to any of the aforesaid ports, nor be employed in fishing on the said coasts, unless such ship shall be wholly and solely manned.
manned with and navigated by a master and mariners all Britifh subjects. The commissioners of the customs may, however, by license under their hands, authorize any such ship or vessel employed in fishing on the coast of Great Britain, or of the islands of Guernsey, Jersey, Alderney, Sark, or Man, to have on board any foreign mariners for the purpofe of inftructing the Britifh mariners thereon in the art of fishing; fuch foreign mariners not exceeding one-fourth of the number of mariners on board fuch vessel, except in cafes of ficknefs, death, defertion, or capture. f. 5.

By Stat. 34. G. III. c. 68, no perfon fhall hereafter be deemed to be qualifed to be the master of a Britifh ship, or to be a Britifh failor, feaman, or mariner, except the natural-born fubjects of his majefty, or perfons naturalized by any act of parliament, or made denizens by letters of denization; or except perfons who have become his majefty's fubjects by virtue of conquest or ceflion of fome newly acquired country, and who fhall have taken the oath of allegiance to his majefy, or the oath of fidelity required by the treaty of capitulation, by which fuch newly acquired country came into his majefty's polfession, except as is hereinafter provided. f. 6.

But every foreign feaman ferving on board any of his majefty's ships in time of war, for the space of three years, who fhall also take the oath of allegiance, fhall be entitled to be employed as a master of a Britifh ship or vessel, or as a Britifh mariner on board any Britifh ship, upon delivering certificates from the captains under whom he ferved, of the time he fhall have ferved, and of his faithful fervice and good behaviour, and a certificate of his having taken the oath of allegiance. f. 7.

No perfon who has taken an oath of allegiance to any foreign fovereign fhall be deemed qualifed to be the master of a Britifh ship or vessel, or a Britifh failor, unless fuch perfon fhall have taken fuch oath of allegiance before he became fo qualifed; and any perfon who fhall, after having become difqualified by taking fuch oath of allegiance, take the charge or command of any Britifh ship or vessel, fhall for every fuch offence forfeit one hundred pounds; and if fuch perfon fhall engage to ferve as a Britifh fefman or mariner on board any fuch ship, he fhall forfeit ten pounds, unless the perfon fhall fhew that fuch difqualifications were un- known to them or their agents at the time of engaging fuch master or failor to ferve on board fuch ship or vessel. Except in the navigation on the seas of America and the Weft Indies, any negroes belonging to his majefty's fubjects, and in the seas to the eftward of the Cape of Good Hope, Laffcars and other natives of any of the countries to the eftward of the Cape of Good Hope, may be employed as Britifh failors, feamen, or mariners, in manner heretofore practifed. Provided nevertheless, that no negro belonging to any perfon who has become a fubject of his majefty, in manner before defcribed, in any of the iflands or colonies late under the dominion of the French, fhall be entitled to be employed in manner before mentioned as a Britifh failor, feeman, or mariner, unless all the conditions required by the 34th G. III. c. 42, fhall have been complied with during the continuance of the faid act.

By the 15th G. II. c. 3, his majefty in time of war may permit merchant ships to be navigated by foreigners, provided one-fourth of the crew be Britifh fubjects. If any goods, wares, or merchandise whatever shall be imported or exported, or carried coaftwise, contrary to the provisions of this act, or any of them, all fuch goods, wares, and merchandise, and also the ship or vessel, with all her guns, furniture, ammunition, tackle, and apparel, fhall be forfeited; and if any ship fhall fail in ballast, or fhall fail to be employed in fishing along the coast in manner herein before mentioned, or, being required to be manned and navigated with a master and a certain proportion of Britifh mariners, in manner herein before directed, fhall not be manned and navigated accordingly, fuch ship or vessel, with all her guns, furniture, ammunition, tackle, and apparel, and all the goods, wares, and merchandise on board, fhall be forfeited. f. 10.

All goods, wares, and merchandise, and all vessels forfeited by this act, may be fized by the commander of any of his majefty's ships of war, or any commiffioners, warrant, or petty officer specially appointed, or by any officer or officers of his majefty's customs or excife.

If any Britifh ship fhall be found at fea, having on board a greater number of foreign mariners than is allowed by this act, or any law in force or hereafter to be made, and the master of fuch vessel fhall produce a certificate of the actual number of fuch foreign mariners in fome foreign port, by occafion of the ficknefs, death, or defertion of the like number of Britifh mariners, or of the fame having been taken prisoners during his voyage, and that Britifh mariners could not be engaged at fuch foreign port to supply their place, and that for the fafe navigation of fuch ship or vessel, it became neceilary to engage and employ fuch foreign mariners, under the hand of his majefty's conful at the foreign port where the mariners are fo engaged, or, if there be no fuch conful there, under the hands of two known Britifh merchants at fuch foreign port, no fizes fhall be made by the perfons authorized under this act, nor fhall fuch ships be molested or detained at fea; but fuch perfons fhall indorse the certificate fo produced, testifying the production thereof, and when and where met with at fea, and that the number of foreign mariners correspond with the certificate of fuch Britifh conful, or fuch known Britifh merchants, for the confideration and investigation of the commissioners of his majefty's customs in England and Scotland refeptively.

By 34. G. III. c. 68. f. 14, no transfer, nor agreement for transfer, of the property in any ship or vessel, either in whole or in part, fhall be made but by a bill of fare or instrument in writing, which fhall contain a recital in words at fuch length of the certificate of regiftry directed thereto.

If a ship be at fea at the time when the transfer is made, fo that an indorfeent and certificate cannot be immediately made, the fare, or contract for fare, fhall, notwithstanding, be made by fome instrument in writing, and a copy thereof fhall be delivered to the perfon authorized to make regiftry, who is to indorse an entry thereof on the oath or affidavit, make a memorandum in the book of regifters, and give notice to the commissioners of the customs as before directed; and within ten days after the ship returns to port, an indorsement fhall be made on the certificate of regiftry, and a copy thereof delivered as before-mentioned; otherwise fuch fare fhall, to all intents and purpoftes, be void. f. 16.

Where the owner of any ship fhall, at the time of transferring the property in any ships, be abroad, fo that an indorfeent, &c. or fuch bill of fare, cannot be immediately made, the fare may be done at any time within fix months after fhuch transfer, in which cafe, within ten days after the arrival of the owner or his agent in this kingdom, (if the ship be in any port thereof, and if not, within ten days after fuch ship's arrival) an indorfeent on the certificate of regiftry fhall be made, &c. as before directed. f. 17.

Matters of ships refusing to deliver up the certificate of regiftry to the proper perfon empowered to make regiftry, upon being required to do by the owner or owners, or the major part of the owners, (if fuch matter have not any property
property therein, or by the other owner or owners, or major part thereof, (if such matter have any share therein,) and upon oath being made by such owner, owners, or major part thereof, before any judge of the peace near where such refusal shall be, such judge may grant his warrant to bring the matter before him; and if it shall appear that the said certificate is falsely detained, such matter shall pay one hundred pounds, and on failure of payment shall be committed to the common jail, for not less than six months, nor more than twelve. f. 18.

Upon the judge's certifying the above false refusal of the matter of any vessel to deliver up the certificate to the person authorized to make regality, he shall register the said ship de novo, the terms and conditions of the law being complied with. f. 19.

When property in any ship or vessel belonging to any of his majesty's subjects shall be transferred by sale, and such vessel shall be required to be registered de novo, it shall not be done unless there be produced to the register, the bill or other instrument of sale. Provided always, that the commissioners of customs, and the governor, lieutenant-governor, or commander-in-chief for the time being of the islands of Guernsey or Jersey, or of any colony, plantation, island, or territory belonging to his majesty, may, upon due consideration of the particular circumstances of the case, give directions for the registering such vessel de novo, and granting a certificate of such registry, notwithstanding such bill or other instrument of sale shall not have been produced as aforesaid; and such registry shall be made, and such certificate thereof shall be accordingly granted, if all the other regulations required by the laws in force concerning the registry of ships de novo be complied with. f. 20.

If there shall be any alteration of property at the same port, and the owner shall be devious of having the ship registered de novo, such ship may be so registered, provided all the rules, regulations, and conditions are complied with relative to vessels registered de novo. f. 21.

In case of any transfer of property in any ship whilst at sea, such ship shall proceed directly to the port for which the cargo then on board is defined, and shall fail from thence to the port of his majesty's dominions to which the belonging, or to any other such port in which the may be legally registered; and such ship may be required to be registered for which her original cargo was defined, or in any other port in the course of her voyage home, such cargo as may be legally carried to such port of his majesty's dominions where she may be so registered de novo. And if such transfer of property shall be made while such ship is in any foreign port, as soon as the master of such ship shall become acquainted therewith, such ship, after having delivered the cargo then on board at the port for which she is defined, shall fail thencefrom to the port to which she belongs, or to any other such port in which she may be legally registered; and may take on board at the port for which her original cargo was so defined, or at any other port in the course of her voyage home, such cargo as may be legally carried to such port of his majesty's dominions where she may be so registered de novo. And if such transfer of property shall be made while such ship is on a filling voyage, as soon as the master of such ship shall become acquainted therewith, such ship, after having filled such filling voyage, without touching at any foreign port, except for the purpose of repairs or refreshments, or for delivering any part of her cargo, shall fail to the port of his majesty's dominions to which she belongs, or to any other such port where she may be legally registered, and may take on board at the port foreign or ports last described, or at any other ports in the course of her voyage home, such cargo as may be legally carried to such port of his majesty's dominions; and every such ship as aforesaid shall be registered de novo, as soon as the returns to the port of his majesty's dominions to which the belongs, or to any such port in which the may be legally registered by virtue of the said act; on failure whereof such ship shall be deemed from thenceforth to be a foreign ship or vessel, and shall not again be registered, or be entitled to the privilege of a British ship or vessel, unless upon special representation of the circumstances of the case to the commissioners of customs, or to the governor, lieutenant-governor, or commander-in-chief for the time being of the islands of Guernsey or Jersey, or of any colony, plantation, island, or territory belonging to his majesty, as the case may be; provided nevertheless, that in no case the ship or vessel of which the property is so transferred, shall be entitled to the privileges of a British ship or vessel, unless the shall return to the port to which the belongs, or to such other port in which she may be registered de novo, within the period of twelve months after the date of such transfer of property, if such ship shall not be on a voyage to the east of the Cape of Good Hope, or to the west of cape Horn; or within two years, if the ship is on the above voyages at the time such transfer of property shall take place, except by the order of the said commissioners, governor, lieutenant-governor, or commander-in-chief respectively. f. 22. See MARINE INSURANCES, and POLICY.

REGIUS PROFESSORS. King Henry VIII. founded five lectures in each of our universities: viz. of Divinity, Hebrew, Greek, Law, and Physic; the readers of which lectures are in the university statutes called regii professores.

REGIUS, in Medicine. See JAUNDICE.

REGLE de l'OCTAVE, Fr., a rule for accompanying the octave ascending and descending in the base; giving to each note of the scale its appropriate harmony in every key. This rule, well known and practiced in the 24 keys, major and minor, will enable students in thorough-bass to figure a base themselves, and to accompany modern music without figures.

It is disputed in France who was the inventor of this rule: Rameau and Rouleau assign it to De Laire, M. Laborde to Campion. "This formula," says Rouleau, "was first published by De Laire in 1700." If this date could be ascertained, it would remove all doubts concerning the author of the rule; as Campion's "Treatise of Accompaniment" is not pretended to have appeared till after 1705.

This rule ascertains what chords or harmony belong to every diatonic movement of the base, ascending and descending. See ACCOMPANIMENT, or THOROUGH-BASE; where the base will be figured, and the chords written over it. We confine the inapplicability of this rule to modern music, as no provision is made for 4ths and 5ths, which so frequently occur in Corelli, Giardini, and Han-del. But these discords, and several other combinations, are considered in the articles COUNTERPOINT and ACCOMPANIMENT, or THOROUGH-BASE; which see.

By this formula it will appear, that to the key-note there is always a common chord; to the 2d of the key, a 5; to the 3d of the key, a 6th; to the 4th of the key, a 7th; to the 5th of the key, a common chord. Thus far the chords are rigorously in one key; but in order to connect the 6th to the 5th, Rameau gives the chord of the 6th to the 7th, as in descending, which makes it the 2d of a new key; but then to recover the modulation into the original key, he gives 7th to the 7th or NOTE SCINTILLO of the key, and then ter-
minutes the scale by a common chord to the octave of the key-note.

In descending, it is necessary to imagine the harmony in the 5th of the key for the four first notes: as, supposing the scale to be in C major, after repeating the common chord to the octave, the 7th of C must be regarded as 3d of the key of G, and be only accompanied by the 6th. A, as 2d of G, by a \( \frac{3}{4} \) as in ascending; and the 7th of the key by a common chord, or close in G. The 4th of the key in descending has a \( \frac{3}{4} \) or chord of the 5th of the key repeated; the next three chords are the same as in ascending.

In minor keys, in which supposing A natural to be the archetype, the chords are much the same; only whenever the 7th of the key is wanting in the ascending scale, it must be accentedly sharp: as to A, a common chord minor; to B, the 2d of the key, a \( \frac{3}{4} \); to the 3d of the key, a 6th; to the 4th, a \( \frac{5}{4} \); to the 5th, a common chord, with a sharp 3d; to the 6th, if natural, a 6th; if sharp, a \( \frac{5}{4} \); to the 7th sharp, a \( \frac{3}{4} \), and a common chord to the octave.

In descending, to the 7th natural, a 6th; to the minor 6th, a 3d, or 6 doubling the 3d; to the 5th of the key, a sharp 3d; to the 4th of the key, the same chord, or a \( \frac{3}{4} \); and to the three rafh, the same as in ascending.

These chords will be more clearly comprehended in notation on the thorough-bafe plates, to which we refer.

Though the regle de l'octave only provides for the regular ascent and descent of the base in plain counterpoint, we know, by long experience, that it teaches more thoroughly and counterpoint in a short time, than any other rule that has been proposed since the laws of harmony were fetled. See Thorough-bafe, Accompaniment, and Composition.

REGLET, or Riglet, in Architecture, a little flat narrow moulding, used chiefly in compartments, and pannels, to separate the parts or members from one another, and to form knots, frets, and other ornaments.

The word is a diminutive of the French, regle, rule.

The reglet, according to Daviler, differs from the fillet and liftet, in that it projects equally, like a ruler.

Reglets, or Riglets, in Printing, are thin rulers, or slips of wood, of different dimensions, placed in the chase, between the pages, and at the extremes of them, to keep them together, and to hold them tight.

The reglets make the chief part of what they call the furniture of the chase. See Chase.

They are particularly denominated from the place they hold in respect of the pages, head-flicks, gutter-flicks, &c.

The term reglets is also used abroad for a ruler of metal, three quarters of an inch long, but which may be lengthened out by joining several together; used to separate the columns, in books that have several in the same page; as also for lines to place the notes on, in printing of music. See Printing.

Reglet is also used for a little thin slip of wood, occasionally, though seldom, used by compositors for the press to take off the lines from the composing-flick, and place them on the galley, where the lines are of an extraordinary length; and where the lines are at great distances, those distances are made by leaving a reglet between each line, when printed.

REGMALARD, in Geography, a town of France, in the department of the Orne; 9 miles E.N.E. of Bellefime.

REGNANO, a town of Naples, in Capitanata; 16 miles from Manfredonia.

REGNANT Queen. See Queen.

REGNARD, John-Francis, in Biography, a French poet and writer of comedy, was born of a good family, at Paris, in 1647. His earliest passion was that for travelling, and he first made the tour of Italy. On his return, in an English ship, the vessel was taken by the Algerines, and the crew made slaves at Algiers. Regnard, by his skill in cookery, ingratiated himself with his master: he polished another art, which had nearly proved fatal to him. His person and manners recommended him to the attention of the ladies, whose advances he encouraged, and being discovered, the alternative was given him of being burnt to death or becoming a disciple of the Koran. He was, however, released from this difficulty by the interposition of the French conful, and the proper application of a considerable bribe. He gained his liberty, and returned to France, and in 1681 departed upon a new tour to the northern countries of Europe. After an absence of three years he came back to Paris, and settled quietly, with the view of cultivating his taste for literary pursuits. He composed a number of comedies for the French theatre, which were acted with success, and which, in the general opinion, placed him next to Molière in true comic humour. Gaity is the predominant character of Regnard's comedies, which is sometimes maintained at the expense of morality. He excelled not lefs in the elevated and genteel comedy, than in the low, or familiar. His two best pieces are said to be "Le Joueur," and "Le Legataire," for describing, to the life, the scenes of the first, he was extremely qualified, being himself a lucky gammer. He wrote eight comedies, some pieces for the Italian theatre, and an opera. He also published miscellaneous poems, consisting of satires, epistles, &c. In prose he gave a relation of his travels, of which the only part that excited much interest was his account of Lapland. Regnard died at the age of 62. His works have been printed collectively, of which the best edition is that of Paris, in 1750, in 4 vols. 8vo.

REGNAVADSOE, in Geography, a small island in the North sea, near the coast of Norway. N. lat. 69° 50'.

REGNI, in Ancient Geography, a name given to the ancient inhabitants of Surrey and Suffex, and perhaps of part of Hampshire. They were feated E. of the Belgae, and S. of the Atrebati. As these people possessed fo large a tract of the sea-coast in the fourth part of this island, it is very probable that they had come from the continent, and settled here not very long before the Roman invasion, perhaps at the same time with their neighbours the Belgae. The Belgae and the Regni had been near neighbours on the continent; the one having migrated from the country of the Sueviones, now Soifons, and the other from the country of the Rhemi, now Reims. The Regni, like all the other Belge Britons, early submitted to the Roman power, and continued steady in their obedience, without engaging in any revolt. It is not known who was sovereign of the Regni when they submitted to the Romans, but soon after their submiffion, they were put under the government of Cogidunus, king of the Dobuni. For this prince, who was then very young, had got fo much into favour with the emperor Claudius, and his ministers, that he was not only allowed to keep his own dominions, but he had several other neighbouring states put under his authority. It seems probable, from a famous inscription discovered at Chicheller, that Cogidunus governed the Regni in quality of the emperor's lieutenant, or legatus Augulf; for in that inscription he is styled. He continued a faithful and useful friend and ally to the Romans above 60 years, and thus he was so much endeared to them, that,
REGNIER, Mathurin, in Biography, a French poet, was born at Chartres in 1573. He is said to have displayed, at a very early period, a great propensity to fatire, which his father in vain attempted to repress by chastisement. The exercise of his satirical talents procured him patrons, among whom were the cardinal Francis de Joyeuse, and Philip de Bethune, both of whom he accompanied to Rome. By the interest of these great men he received considerable preferment in the church, but the dignity and gravity of the clerical character was no restraint upon his pleasures, and he died at the age of forty, worn out with licentious practices. The works of Regnier confilt of satires, epistles, elegies, flanzas, odes, &c.: of these his satires are most esteemed, and they were thought to make a kind of epoch in French poetry. The poems of Regnier have been frequently printed; the best editions are those of Rouen, 1729, and of London, 1734, with remarks.

REGNIER-DESMARAIS, Francis-Seraphin, a French author of considerable reputation, was born at Paris in 1632, of a family originally from Saintonge. Being the younger son of a numerous family, he had to depend solely upon his own exertions for making his way in the world, and he succeded with felicity to several pensions of rank, whom he accompanied to their travels. Making a proper use of his opportunities, he acquired a knowledge of the Italian and Spanish languages, and he became so much a master of the former, that when he attended the duke of Crequi on his embassy to Rome, in 1666, he wrote the official letters in Italian with so much purity, that they were not known to be the compositions of a foreigner. But he obtained a still greater triumph, by passing upon the academicians of Della Cruca one of his own odes for a newly discovered piece of Petrarch. In consequence of this he was elected, in 1667, a member of that celebrated academy. At the age of thirty-six he took ecclesiastical orders, for the purpose of enjoying a priory given him by Lewis XIV., as a recompense for his public services; and in 1670 he was admitted a member of the French Academy, in the hope that he might become a contributor in the compilation of their dictionary. Soon after this, at the request of the Jesuits, he translated from the Spanish language a treatise "On Christian Perfection." In his capacity of academician, Regnier displayed so much activity and zeal, that on the death of Mezerai, in 1684, he was appointed to succeed him as secretary. When the dictionary was completed, the secretary by order of the Academy, drew up a preface, and an epilogue dedication to the king; but, during his absence, other members, who were inspired with the desire of emulating him in this honour, procured a preference for their own productions. This disappointment drew from Regnier some critical remarks upon the rival performances, tinged with that cavilling and disputatious spirit, to which it appears he so often gave way, that he obtained the title of the abbé Pertinax. He was so attached to his own opinion, that he could seldom be prevailed upon to give up his point, or to drop a dispute. Fontenelle, being once present at an academical discussion, in which Regnier was warmly engaged, exclaimed, "this is a dispute that might be prevented from ever ending, and therefore it ought to be ended immediately." Regnier obtained several benefices, and would probably have been promoted to the very highest dignity in the church, had he not been suspected of translatting a scene in the "Pafor Fido," which seems to inculcate a licentious morality, and likewise suspected of writing a still more objectionable copy of verses. He was occasionally employed in public business. He died at Paris in 1713, at the age of 81. He had drawn up a great many of the most important articles in the dictionary of the French academy, and he published, as the result of his long study of the principles of the French language, his "Grammaire Françoise," in 2 vols. 12mo., which is considered as a very valuable performance. His other works in prose were "L'Histoire des Déméles de la France, avec la Cour de Rome, au Sujet de l'Affaire des Cortes." Translations of several of Cicero's pieces. In verse he gave an Italian version of the Odes of Anacreon, and miscellaneous poems in Latin, French, Italian, and Spanish. His French poems are varied, ingenious, and well turned, but they are allowed not to polishe much fire or force. We have alluded to the abbe's unyielding disposition: but it must be added, that he was redolent in his friendships, inexibly upright, and ferupulously veracious. The last quality, says his biographer, he nobly expressed, when, on being urged to violate the truth in favour of a man in power, and under the penalty of losing his friendship, he said, "I had rather quarrel with him than myself."
The term is now chiefly used, as it is described by flat. 5 & 6 Edw. VI. cap. 14, to denote one that buys corn, or other dead victuals, in any market, and sells them again, in the same market, or within four miles of the place.

Regrating is an offence against the public, and is liable, by the statute just cited, to the same penalty with engrossing and forsetting.

Regulator is also used for a person who furnishes up old moveables, to make them pass for new. See Frappery.

Among masons, &c. to regrate is to take off the outer surface of an old hewn stone, with the hammer and ripe, in order to whiten and make it look fresh again.

Regression, or Retrosgradation of curves, &c.

REGULAY, in Geography, a town of France, in the department of the Morbihan; five miles N.W. of Joffelin.

REGULA. See Rule.

REGULAR, in Architecture. See Reglet.

REGULAR, Regularis, denotes the relation of any thing that is agreeable or conformable to the rules of art.

In this sense, the word stands opposed to irregular, or anomalous.

Thus we say, a regular proceeding, a regular building, regular poem, regular verb, &c.

Regular Figure, in Geometry, is a figure which is both equilateral and equiangular; i.e. whose sides, and consequently its angles, are all equal.

The equilateral triangle and square are regular figures. All other regular figures, consisting of more than four sides, are called regular polygons.

Every regular figure may be inscribed in a circle; which see.

For the dimensions, properties, &c. of regular figures, see Polygon.

Regular Body, called also Platonic body, is a solid terminated on all sides by regular and equal planes, and whose solid angles are all equal.

The regular bodies are five in number; viz. the cube, which consists of six equal squares; the tetrahedron, or regular triangular pyramid, having four equal triangular faces; the octahedron, having eight; the dodecahedron, having twelve pentagonal faces; and the icosahedron, having twenty triangular faces. See each under its proper article.

Besides these five, there can be no other regular bodies in nature.

To measure the surface and solidity, &c. of the five regular bodies.—The solidity, &c. of the cube is shown under the article Cube. The tetrahedron being a pyramid, and the octahedron a double pyramid, and the icosahedron consisting of twenty triangular pyramids; and the dodecahedron of twelve quinqueangular ones, whose bases are in the surface of the icosahedron and dodecahedron, and their vertices meeting in a centre; the solidities of these bodies are all found from what we have shewn under Pyramid.

1. Their surface is had by finding the area of one of the planes, from the lines that bound it; and multiplying the area thus found by the number from which the body is denominated: e.g., for the tetrahedron, by 4; for the hexahedron, or cube, by 6; for the octahedron, by 8; for the dodecahedron, by 12; and for the icosahedron, by 20. The product is the superficial area.

Or, the superficial contents of any of the five Platonic bodies may be had by the following proportion; as 1 is to the square of the side of the given Platonic body,

\[
\text{That may be inscribed in the sphere, is} \left(\frac{1}{2}\right)^2 \times \text{That may be circumscribed about the sphere, is} \left(\frac{1}{3}\right)^2 \times \text{That is equal to the sphere, is}
\]

\[
\begin{align*}
\text{Tetrahedron} & \quad 0.816497 \quad 2.44948 \quad 1.04417 \\
\text{Octahedron} & \quad 0.707107 \quad 1.22474 \quad 1.03576 \\
\text{Hexahedron} & \quad 0.577351 \quad 1.00000 \quad 0.88610 \\
\text{Icosahedron} & \quad 0.525731 \quad 0.66158 \quad 0.62153 \\
\text{Dodecahedron} & \quad 0.356822 \quad 0.44903 \quad 0.40883
\end{align*}
\]

Hence we have the following rule: multiply the proper tabular area, taken from the preceding table, by the square of the side of the given solid, for the supericies.

2. The diameter of a sphere being given, to find the side of any of the Platonic bodies, that may be either inscribed in the sphere, or circumscribed about the sphere, or that is equal to the sphere.

As 1 is to the number in the following table, respecting the thing sought, so is the diameter of the given sphere to the side of the Platonic body sought.

3. The side of any of the five Platonic bodies being given, to find the diameter of the sphere, that may be inscribed in that body, or circumscribed about it, or that is equal to it. As the respective number, in the above table, under the title, inscribed, circumscribed, or equal, is to 1, so is the diameter of the given Platonic body to the diameter of its inscribed, circumscribed, or equal sphere, in solidity.

4. The side of any of the five Platonic bodies being given, to find the side of either of the Platonic bodies, which are equal in solidity to that of the given body. As the number under the title equal, against the given Platonic body, is to the number under the same title, against the body whose side is sought, so is the side of the given Platonic body to the side of the Platonic body sought.

5. To find the solid contents of any of the five Platonic bodies. As 1 is to the cube of the side of any of these bodies, so is 0.1178513 to the solid content of a tetrahedron, 0.4174045 to that of the octahedron, 2.1816050 to that of the hexahedron, 7.6631189 to the solid content of the dodecahedron.

Hence we have the following rule: multiply the tabular solidity by the cube of the side or linear edge, for the solid content. The demonstration of this rule, and that for the supericies above given, is as follows:

The tabular numbers denote the surface and solidity of each body, when its side or edge is one; and, because, in similar bodies, the surfaces are as the squares of the linear edges, and the solidities as the cubes of the same, the truth of the rules is manifest.

If one of these bodies be required to be cut out of the sphere of any diameter, let \( dr \) (Plate XI. Geometry, fig. 9) be the diameter of any sphere, and \( da \) one-third of it, \( ab = br \). Erect the perpendiculars \( ac, cf \), and \( bg \); and draw \( de, df, er, fr, f, r \); and then will (1) \( r \) be the side of the tetrahedron; (2) \( df \) the side of the hexahedron; (3) \( dr \), the side of the octahedron; (4) \( df \) cutting \( de \) in extreme and mean proportion in \( h, d, b \) will be the side of the dodecahedron; (5) fitting the diameter \( dr \) up perpendicular at \( r \), from the centre \( c \), to its top, draw the line \( eg \).
cutting the circle in g, let fall the perpendicular g b; so is
b r the side of theicosahedron.

Regular Curves. See Curve.

Regular Architecture, Fortification, &c. See Architecture, and Fortification.

Regular Attacks, in a siege, are those that are made in
form, or by regular approaches. See PARALLELS.

Regular Bastion. See Bastion.

Regular Place. See Place.

Regular, in the Monastic Sense, denotes a person who
has made the vows in some religious house. See Religious
and Vow.

Under regulars are comprehended the whole body of
monks, friars, and mendicants, &c.

The denomination of regulars, in this case, arises hence,
that they are bound to observe the regular or rule of the order
they are entered into. Hence,

Regular Priest is used for a priest who is in some reli-
gious order, in opposition to a secular priest, who lives in
the world, or at large.

A cardinal is reputed both regular and secular, and is
intitled to the privileges of both states.

Regulars may be promoted to bishoprics and archbishop-
rics, as well as seculars; but their promotion secularizes them;
the episcopal dignity dispelling them from the observa-
tion of the rule of which they had before made pro-
fection.

Regular Abbots. See Abbot.

Regular Benefices, are such as can only be held by
monks or religious; or at least, per cupientem profiteri, by a
person defirous to embrace the monastic life. See Benefice.

It is a maxim in the Romish canon law, regularia regular-
ribus, i.e., regular benefices are to be conferred on regular
priests. The abbots that are chiefs of their respective orders
are all regular, and can only be served by monks and cardinals.
All benefices are presumed to be secular, unless they be
proved regular.

Anciently the regular benefices were almost all conferred
by way of administration or curacy; the religious incum-
bents being always ad manum to their superiors, who disp lace
them at pleasure. Hence the common maxim among the
canonists, omne beneficium regulare manuale.

The benefices appropriated to regulars are abbeys, con-
ventual priories, simple priories, and clausal offices. They
may be conferred on ecclesiastics in commendam.

Regular Canons. See Canon.

Regular Places, are those within the boundary or inclo-
sure of the convent; as the cloister, dormitory, chapter, and
refectory. In opposition to those defined for guest, and
for the necessaries of the house, which are reputed without
the inclosure.

Regular Corporation. See Corporation.

REGULATION, a rule or order prescribed by a
superior, for the uniform and orderly management of some
branch of policy, justice, or the like.

REGULATOR of a Watch, is a small spring belonging
to the balance, serving to adjust the going, and to make it
go either faster or slower.

REGULATOR of Velocity, in Mechanic, is a contrivance
for regulating or governing the motion of a mill, or other
large machine, by means of which it will always be cau ed
to preserve an equable and regular velocity in the motion
of its parts, notwithstanding any accidental increase of the
moving force, or decrease of the resistance that may occa-
onally arise. A regulator must be connected with some
lever, or other parts of the machine, which commands the
supply of whatever constitutes its moving force, as the
shuttle of a water-wheel, the sail-cloth of a wind-mill, or
valve of a steam-engine; and it should have the property
of acting suddenly upon this lever, or other part, the influ-
ent any increase or decrease of velocity in the motion takes
place, either to elevate or depress it, and thus regulate the
supply in a degree proportioned to the quantity of altera-
tion in the velocity; and it is by the sensibility and accu-
ricy of the regulator in this respect that its perfection is
estimated.

The regulator most commonly used is called a governor.
This consists of two or more pendulums suspended from
joints, which are supported upon a vertical axis; this being
cau ed to revolve by the machine, and the pendulums ac-
companying it, the balls will, by the centrifugal force,
recede from the axis or centre a quantity proportioned to
the velocity of the motion and length of the pendulum:
then, on any accession of the motion, they recede still further
from the axis, or vice versa, if the velocity diminishes. This
motion is contrived to actuate the lever which regulates
the velocity of the machine in a steam-engine: it is con-
ected with the valve which admits the steam from the
boiler to the cylinder, in a water-wheel with the shuttle,
through which the water flows, or in a wind-mill with
the mill-fores, or sail-cloths. See a farther description
under MILL-WORK, STEAM-Engine, and WINDMILL.

The principle of the governor is the same with the cir-
cular or conical pendulum, of which Huygens has laid
claim to the invention, as well as of the long pendulum
for regulating clocks, who first discovered it nearly at the time
as the other. The conical pendulum circulates seconds
when of the same length with the common pendulum, which
will vibrate only half seconds. To explain it, we must sup-
pone a ball or weight to be suspended by a string or rod,
so that the ball can describe in a horizontal circle by a
motion of the rod round a vertical axis, with which the
centre of suspension coincides. In this motion the rod of
the pendulum will describe the surface of a cone, of which
the point of suspension is the vertex, and the horizontal
circle which the ball describes is the base: it is hence called
the circular or conical pendulum. The ball has liberty to
recede from, or approach to, the axis, by moving upon its
centre of suspension, and thus the circle the ball describes
will be enlarged or diminished; and it is this circumstance
which gives it the property of circulating or performing a
revolution always in the same space of time which a simple
pendulum of four times the length would vibrate: for this
takes place equally whether the ball is extended to describe
a large circle, or retracted to revolve in a small one; though,
it should be observed, that this is only true in the suppo-
sition that the pendulum-ball, in moving from the vertical
axis upon its centre, will describe a parabola instead of a
circle, in the same manner as the ball of a common pen-
dulum is required to move in the arc of a cycloid instead
of a circle, to cause all the vibrations, both long and short,
to be performed in equal spaces of time. Mr. Martin has,
in his Inquisitions, given a very complete explanation of the
principle of this pendulum, by supposing an inverted para-
boloid, with its axis placed in a vertical position; then sus-
pending a bowl or vessel excavated by the revolution of this
figure upon its axis a paraboloid will be formed. A heavy
globe or ball being put in this bowl, may, by agitating the
vessel, be caused to perform a revolution in a horizontal
circle within the vessel, and it will be found to circulate in
the same period of time, whether it describes a small circle
near the bottom of the vessel, or a large circle in its upper
part, where the diameter is larger.
The governor or flying-ball is the regulator most generally used in machinery, although there are other means which, in particular instances, are preferable, from the circumstance of their producing a greater power to operate upon the regulating part of the machine. One of these, called the water-regulator, consists of a pump, which, being worked by the machine, will raise water into a cylinder, from which a constant stream flows off by a pipe and cock; a float is placed upon the surface of the water in the cylinder, and this communicates with the steam-valve of the engine, or shuttle of the water-wheel. The operation of this regulator is easily explained, for the pump will raise a quantity of water exactly proportioned to the velocity of the machine, or the number of strokes it makes; whereas the stream which flows off by the cock is a constant quantity, and equal to that which the pump will supply when the machine moves with its intended velocity. When this is the case, the surface of water in the cylinder will stand at the same height; but if the velocity is increased, the pump will raise more water into the cylinder than the pipe and cock will carry off, and the surface rising, elevates the float, which, by its action to diminish the supply of power to the machine, will correct the acceleration which had taken place in its velocity. The opposite effect takes place if the velocity decreases, viz. that the supply to the cylinder being diminished whilst the efflux is constant, the surface will sink, and the float descending, opens the valve or shuttle, and increases the supply of power to the machine until it regains the original velocity. The great advantage of this regulator is, that it can so readily be made to keep the machine steady at any velocity which may be required, and this by merely opening or closing the cock; thus, if it is opened to carry off a greater quantity, the surface will subside, and the float, by descending, opens a greater supply of power to the machine, and occasions it to move quicker; but this, though it raises more water by means of the pump, will not raise the surface of the water in the cylinder to so great a height as it stood at before, because the efflux is now equal to the increased supply.

In all cases this regulator will cause the machine to work at such a rate, as to make the pump raise the same quantity of water as the cock emits, and its rate may be ascertained before it is put to work; for if the quantity of water which the cock will discharge in a minute, or other given space of time, is known, and the dimensions of the pump, then it may easily be calculated what number of strokes per minute the pump must make to raise an equal quantity of water. The feasibility of this regulator will be increased by making the cylinder of a small size, because then any deviation from the intended rate of working will cause the greater elevation or depression of the surface, and a greater action on the float: and, for the same purpose, it is best to make the cylinder gradually diminish in area, so as to be smaller both towards the top and at the bottom, than at the place where the surface is expected to stand when the machine moves with the proper velocity. By this means it will rise or fall more rapidly, in consequence of the diminished area of the cylinder, when the alteration of velocity is considerable, and a greater correction is required, than when the alteration is only trifling. It is necessary that the pump should raise a constant stream of water into the cylinder, both in the ascent and descent of its bucket: to do this, two pumps, acting alternately, may be used, or by a very simple contrivance a single pump may be made to effect the same; thus, upon the rod of the pump a cylinder of wood is fixed, which is of such a diameter, that its area is equal to half the area of the pump-barrel, and its length being equal to the length thereof, its content will be equal to one-half of the barrel: this is fixed on such a part of the rod, that it will, by the rising and falling of the rod, be drawn up out of water as much as the rod and bucket moves; now, when the pump-bucket is drawn up, the rising of the cylinder above the surface of the water increases the capacity of the cylinder one-half as much as the quantity of water which is thus drawn up into it, and the efflux of water by the cock being just equal to the other half, the surface will be stationary; and when the bucket descends, and no water is raised, the cylinder going down into the water diminishes the capacity of the cylinder a quantity equal to the quantity of water which will flow off in the same time, and thus supplies the want of water which flows off in the same time. A regulator of this kind may, in many cases, be formed from some part of the machine, without any additional apparatus; thus, the cold water-pump of a steam-engine will raise the necessary water into a cylinder for the float to act in, and this float must be connected with the arm of the steam-valve. Also, in an engine for blowing a furnace, where it has a water-regulator (see Blowing), the rife of the water in the external cylinder may regulate the motion of the engine, the whole machine being of the same kind with the regulator we have described.

A regulator would be applied with great advantage to a machine which is used in the Cotton Manufacture (see that article), for drawing a piece of cotton cloth regularly and slowly over a red-hot cylinder of iron by two rollers, from one of which it is wound to the other; now, if the men who turn these rollers do not make a moment the cloth is burnt through, but by a regulator it might be lifted off the hot iron, an instant before the motion was far diminished to endanger the rolling of it.

The water-regulator is rendered more powerful by suspending the cylinder from the end of a lever, like a scale-beam, the opposite end of which has a counterpoise sufficient to balance the weight of the cylinder when the water in it stands at the intended height; but if the water increases in the cylinder from the causes above described, the box will descend, and the motion of the lever will act upon the machine to make the regulation the same as the motion of the float: on the other hand, when the water in the cylinder diminishes, the counterpoise will draw it up and give motion to the lever. The water from the pump is introduced to the cylinder by a spout, and all the other parts have the same construction as we have described.

It is a defect of both the regulators we have above described, that they do not operate upon the machine until the alteration of velocity has actually taken place, although they immediately correct it. It would be desirable to have others which would make the correction before the evil takes place: for instance, in a wind-mill, which is more subject to irregularity than any other machine, a large vane may be suspended by a heavy pendulum, and opposed to the wind; now the force of the latter, when blowing regularly, will cause the pendulum to incline a certain quantity from the perpendicular; but if the wind increases or diminishes, it will incline more or less, and this motion may be communicated to the shuttle which regulates the feed of corn, so as to give more or less to the looms in proportion to the power of the wind for grinding it, thus adapting the resistance to the power; and if this should increase beyond all bounds, the fame motion may be made to act upon the grip of the mill to check its acceleration effectually. In the same manner a water-wheel may have a float placed in the dam or head to act upon the shuttle whenever the surface thereof rises or falls above or below
below the intended level, so as to apportion the supply to the fall, and keep the velocity uniform.

There is another kind of regulator sometimes used in machines to cause a sufficient resistance to the motion to prevent acceleration, such as a crane or lowering machine, which is to let down a heavy weight, a coal winding machine, &c.; a very good one for these purposes is a vertical axis with pendulums, like the governor, but having a broad vane to meet the air instead of heavy balls, which indeed may be added also; this, when put in motion, will oppose a very great resistance to the acceleration, because the centrifugal force causing the vanes to recede from the centre, they must describe a larger circle in the air in proportion to the velocity, or, by colliding, they make but little resistance when the velocity is small.

REGULO, a title given to the sons of the emperor of China.

REGULUS, Marcus Attius, in Biography, a celebrated Roman general, was raised to the consulship the first time in the year 267 B.C., and, in conjunction with his colleague Libo, obtained the honour of a triumph on account of their successes over the Salentines, from whom they took their capital Brundisium. During the first Punic war the Romans elected Regulus consul, together with Lucius Manlius Vulso, B.C. 256, and gave them orders to carry their arms into Africa. They failed with a very powerful fleet, and in their voyage encountered a superior Carthaginian force, under Hanno and Hamilcar, which they totally defeated. After refitting in Sicily, and taking fresh troops aboard, the consuls failed for the African coast, where they took possession of the town of Clupea. They next advanced towards Carthage, which city was thrown into the utmost consternation by this unexpected invasion; and, after plundering the country almost to its gates, they returned to Clupea loaded with booty of all kinds. Very soon after this, orders arrived from Rome for the return of Manlius, leaving Regulus with part of the fleet and army to conduct the war in Africa. Regulus asked for his recall upon the following plea: he was perplexed of a farm of seven acres, from which his family derived its subsistence, and being informed that his servants were carrying off his flock, he begged that he might return to save his family from flaying. The plea was overruled, by an order that they should be maintained by the public during his absence upon the service of his country. He again advanced towards Carthage, crossed the river Bagrada (in passing which, according to the Roman historians, he was encountered by a monstrous serpent,) and laid siege to a town not far from the metropolis. Hamilcar attempted to relieve the place, but Regulus met him and gave him a very signal defeat. After this he took several towns, without any resistance. A revolt of the Numidians reduced the Carthaginians to still greater difficulties, so that it appears the enemy fought for peace. The terms, however, offered by Regulus were so unreasonable, that the Senate of Carthage could not for a moment listen to them, and resolved upon a vigorous prosecution of hostilities. During the interval of negotiation a body of Greek mercenaries arrived at Carthage, commanded by Xantippus, a Spartan, by whom the Romans were completely defeated, with the loss of 30,000 men, besides 15,000 taken prisoners, among whom was Regulus himself, whom the Carthaginians brought in triumph into that city, which, but a few hours before, he had not only insulted, but, in his own mind, devoted to destruction. Hereafter, says the historian, Regulus had appeared only as a Roman commander, and not one of the most conspicuous; the concluding scenes of his life are those which entitle him to rank among the first of Roman patriots. The Carthaginians behaved to their other prisoners humanely, but Regulus they treated with all the barbarity which they could devise; but, when the fortune of war appeared to turn against them, they began to use him with more lenity, in order that they might engage him to endeavour to obtain an accommodation. At their desire he went with their ambassadors to Rome, having first taken an oath that he would return to his prifon, if the negotiation should not succeed. When he arrived at the gates of the city he refused to enter, being, as he said, a slave to the Carthaginians; and when his wife and children came out to meet him, he viewed them as strangers, and declined their care. The senators assembled to give audience to the Carthaginian ambassadors, prefled him to take his seat among them, but he refused, till commanded by his masters to accept it. When he was called on for his opinion, he spoke strongly both against granting the Carthaginians peace, and exchanging himself and the other Roman captives for the prisoners of importance whom they had taken from that nation. Though convinced by his arguments, the senators were unwilling to feed back so noble a citizen, and a subservient was suffixed to him by which he might be relieved from his oath, but he instantly rejected the base suggestion, and declared his resolution to return to Carthage in the face of the cruel punishment that he knew awaited him. Acting upon the idea that he was still a slave, he took no leave of his family, but, with an unmoved countenance, made his way in silence through the crowds of his admiring countrymen. The Carthaginians were told that their offers of peace were not only rejected at Rome, but chiefly so through the means of Regulus, whom now they resolved to punish in the severest manner possible. For some days he was exposed to the rays of a meridian sun, and afterwards confined in a barrel, whose sides were every where filled with large iron spikes, till he died in the greatest agonies. His sufferings were heard of at Rome, and the Senate permitted his widow to inflict whatever punishment she pleased on some of the most illustrious captives of Carthage, and she took a severe revenge, till at last the Senate interposed, and put a stop to the barbarity of her punishments. Regulus perished in the year B.C. 251. Univ. Hist.

REGULUS, Petre King, in our Ancient Calumns, is a term frequently used, in the Saxon councils, for comes or count.

Hence sub-regulus was also used for a vice-comes or vice-count; though in many places the two terms were used indifferently for the same dignitary. Thus in the archives of the cathedral of Worcester, Utherdoes sometimes styles himself regulus, and sometimes sub-regulus, of the city of Worcester.

But in other places we find a distinction: "Offa, rex Merciorum; Utherdoes, regulus; Aldredus, sub-regulus, &c."

Regulus, Konig, Germ., in Chemistry, denotes, in its most extensive sense, a metal in the proper metallic state. The term is now little used, though the old chemists chiefly employed it as a distinctive appellation in those cafes where a metal and one of its ores happened to be called by the same name. Thus, the grey sulphuret of antimony was not known by the name of antimony long before it was suspected to contain a peculiar metal; when this discovery took place, the metal was called regulus of antimony, in order to distinguish it from the ore from which it was procured. For the same reason, the metals arsenic and cobalt were denominated the reguli of arsenic and cobalt.

Regulus of Antimony. See Antimony.
REGULUS, Martial, of Antimony. See Antimony.

REGULUS of Asaratic, See Arsenic.

REGULUS of Cobalt. See Cobalt.

REGULUS, in Astronomy, is a star of the first magnitude, in the constellation Leo; called also, from its situation, Cor Leonis, or the Lion's Heart; by the Arabs, Alhazard; and by the Chaldeans, Kalheheed, or Kalheheet; from an opinion of its influencing the affairs of the heavens; as is observed by Theon. See Leo.

REGUSSE, in Geography, a town of France, in the department of the Var; 9 miles N.E. of Barjols.

REGVA, a river of Africa, which runs into the Mediterranean; 16 miles E. of Algiers.

REHABERE facias sefiam, quando vicecomes liberavit feciams de majore parte, quam debet, in Law, a writ judicial; of which there is another of the same name and nature. (Reg. Jud. 13. 5. 1.) It lay when the sheriff in the Halere facias sefiam had delivered more than he ought.

REHABILITATION, REHABILITATION, in the Civil and Canon Laws, an action by which a prince or pope, by dispensation or letters patent, reflores a delinquenct to the condition he was in before his delinquency. See DEGRADA-

TION.

The king alone can rehabilitate an officer, noted, condemned, and degraded; or a gentleman who has derogated from his rank.

The pope alone pretends to rehabilitate, i.e., to render capable of benefits and orders, such as had fallen into heresy or other irregularities.

In Roman countries, an ecclesiastic who attains the ex-

ecution of a sentence of death, is to be rehabilitated by an abolution, called a facias.

By the rehabilitation of a convict in the Code Napoleon, or French criminal jurisprudence, is understood his restoration to all the rights and privileges which he had forfeited by being subjected to a painful or infamous punishment. He cannot demand it till five years have elapsed since the execu-

tion of his sentence, during the whole of which time he must have resided in the same arrondissement; or unless he has been domiciled during two complete years in the territory of the municipality to which the demand is addressed. It must also be supported by testimonials of his good conduct from the municipal authorities. The criminal court receives the demand, and pronounces on it at the end of three months: if their judgment be unfavourable, the application may be renewed at the end of five years, with the same advantage; but if the party rehabilitated into society should offend again, he becomes incapacitated for ever.

REHBURG, in Geography, a town of Westphalia, in the principality of Calenbg; 18 miles W.N.W. of Hanover.

REHEARING, in the Court of Chancery, is a proceeding to which either party, that thinks himself aggrieved, may have recourse, before the execution of a final decree. Every petition for a rehearing must be signed by two counsel of character, certifying that they apprehend the cause is proper to be reheard. And upon the rehearing, all the evidence taken in the cause, whether read before or not, is now ad-

mitted to be read; because it is the decree of the chancellor himself, who only now fits to hear reasons why the should not be enrolled and perfected; at which time, all omissions of either evidence or argument may be supplied. But after the decree is once signed by the chancellor, and enrolled, it can not be reheard or rectified, except by bill of review, or by appeal to the house of lords.

REHEARSAL, in Music and the Drama, an essay or experiment of some composition, which is made in private, previous to the representation or performance of it in public; to habituate the actors or performers, and make them more ready and perfect in their parts.

REHOBOOTH, in Geography, a post-town of America, in Br brisk, county, Massachusetts, on a branch of Providence river, a few miles from Providence, in Rhode island; 40 miles southerly from Bolton. It was called "Seconnet" by the Indians; incorporated in 1645, and contains 4866 inhabitants.

REHUT, a town of Hindooftan, in the circuit of Go-

bud; 20 miles S.S.W. of Gwalior.

REI Domesticus. See Domesticus.

REICH, in Geography, a town of Austria; 7 miles N.W. of Schwanteif\ad.

REICHARDT, John Frederic, in Biography, chapell-\nmaster to Frederic II. king of Prussia, at Berlin, was born at Königsegg, in Prussia, in 1751, and studied under the organist of the principal church. Richter taught him the harpsichord, and formed his taste. He likewise practised the violin, and was powerful upon that instrument, particularly in double stops. With these talents he travelled in 1771, distinguishing himself in Upper and Lower Saxony, Drefden, Leipzic, Brunswick, Hamburg, and Berlin; where he was appointed by the king, in 1775, chapell-\nmater, in the fiation which Graun had formerly illu-

trated.

The first composition which he produced in his new office, was a prologue to Graun's opera of "Angelica e Medoro," which he set on occasion of a visit to the king of Prussia by the grand duke of Russia, in 1776; in which prologue he composed the famous air "Nell' errone d'Astra Foreseta," for Mad. Mara.

In 1783 he went to Paris, and gave proofs of his abilities at the concert spirituel; and in 1784, he was present at the commemoration of Handel in London. He married the daughter of Francis Benda, born the fame year as himself, an excellent finger.

REICHELIA, in Botany, Schreb. Gen. 200. (Sa-

gonca; Aubl. Guian. t. 111. Juf. iff. 134. Lamarek II-

luft. t. 212.) Reduced by its author, on the fuggestion of Swartz, to Hydroa; Schreb. 826. There have been two botanists of the name of Reiche; but Schreber, most probably, had principally in view George Christian Reichel, professor of medicine at Leipzic, who published a dissertation on the Spiral Vessels of Plants, and died in 1771, at the age of 44.

REICHELSBERG, in Geography, a lordship of Ger-

many, in the circle of Franconia, deriving its name from a mountain citadel, near the town of Aue, in the duchy of Wurzburg.

REICHELSBERG, a town of the duchy of Wurz-

burg; 20 miles S.E. of Wurzburg.

REICHELSDORF, a town of Bavaria, in the terri-

tory of Nuremberg; 7 miles S. of Nuremberg.

REICHELSHEIM, a town of the duchy of Wurz-

burg; 4 miles W. of Arntheim.—Alfo, a town of the prin-

cipality of Naftau Weilburg, inhabited in the bithopic of Fulda; 30 miles S. of Marburg.

REICHELWAND, a town of Bavaria, in the terri-

tory of Nuremberg; 3 miles E. of Lauf.

REICHENAU, an ifland in the lake of Conftance, about two miles long, and abounding with vines and other fruit.
fruit trees, with a celebrated abbey, and the villages of Upper and Lower Zell.—Alto, a town of Bohemia, in the circle of Chrudim; 9 miles W.N.W. of Poltitzka.—Alto, a town of Anfria; 5 miles S.W. of Freylstadt. Alto, a town of Saxony, in the Vogtland, near Pawla.—Alto, a town of the Helvetian republic, at the union of the two branches of the Rhine; 6 miles S.W. of Coire.—Alto, a town of Bohemia, in the circle of Bechin; 6 miles E. of Rosenberg.—Alto, a town of Bohemia, called "New Reichenau," in the circle of Bechin; 8 miles E.S.E. of Pilgram.—Alto, a town of Pruffia, in the province of Oberland; 8 miles S.E. of Osterrod.—Alto, a town of Pruffia, on the Olfa; 22 miles E.N.E. of Culm.

REICHENBACH, a town of Saxony, in the Vogtland, containing about 700 houses, two churches, and a Latin school. The inhabitants are chiefly clothiers, and dealers in cloth. Their method of dyeing is held in high estimation, the most beautiful color in the whole electorate being made at this place; 10 miles S.W. of Zwicken. N. lat. 50° 31'. E. long. 12° 16'. Alto, a town of Silefia, in the principality of Schneidwitz, containing two churches and an hospitall. The town has some considerable manufactories of linen, canvas, and fufian; 9 miles N. of Schneidwitz. N. lat. 50° 35'. E. long. 16° 35'. Alto, a town of France, in the department of the Sarre; 8 miles S. of Lauverec. Alto, a town of Lufatt; 4 miles S.W. of Camenberg. Alto, a town of Pruffia, in the province of Oberland; 7 miles S.S.W. of Holland. Alto, a town of Germany, in the county of Henneberg; 3 miles N. of Smalkalden. Alto, a town of Germany, in the principality of Cumbach; 12 miles E.N.E. of Neufadt. Alto, a town of Germany, in the margravate of Anfach; 2 miles N.W. of Schwarbach.

REICHENBERG, a mountain of Swabia; 6 miles N.W. of Fuiïthing.-Alto, a town of Bohemia, in the circle of Boleslaw. Twenty thousand pieces of cloth are supposed to have been made in this town in one year; 25 miles N.N.E. of Jung-Bunztla. Alto, a town of Prufia, in the province of Ermeland; 3 miles S.W. of Heilberg. Alto, a town and castle of Wѣllphalia, in the county of Catzenhogenbogen; 5 miles E. of St. Goar.

REICHENBÜRG, a town of the duchy of Stidia; 12 miles S.S.E. of Cilley.

REICHENSECK, a town of the duchy of Stidia; 5 miles E.S.E. of Cilley.

REICHENFELS, a town with a castle in Saxony, in the principality of Reuss; 8 miles N.W. of Greitz.—Alto, a town of the duchy of Carinthia; 24 miles N.E. of Claagenfurt.

REICHENHALL, a town of Bavaria, on the Salz, with a rich salt spring, the water of which is partly boiled here, and partly, by means of a large wheel 36 feet in diameter, thrown up to the higher parts of a lofty house, and thence conveyed by means of leaden pipes to the distance of 12 miles, over mountains, towards Traunstein, and then boiled, on account of the convenience of wood, and also of exportation. An aqueduct of lanced flints, two miles long and five feet broad, with an arched roof, was formed some centuries ago, for conveying water to turn the wheels and other engines, and to carry off any superfluous wat-ter. This aqueduct, after running to a depth of 12 fathoms under the town, and from thence under the gardens and fields, at last discharges its water in a strong torrent. The current of the water is so strong, that a boat with torches may fall from one end to the other in a quarter of an hour. In the aqueduct are five apertures in the form of towers, and through some of these a person may speak from the run-

parts of the town with those who fail upon the canal; 9 miles S.W. of Salzburg. N. lat. 45° 40'. E. long. 12° 50'.

REICHENSTAIN, a town of Austria; 19 miles N.E. of Steyregg.

REICHENSTAIN, a town of Silefia, belonging to the principality of Bierg, but infallid in that of Mulfertberg; 16 miles W. of Neffe. N. lat. 50° 15'. E. long. 17° 40'. Alto, a town of France, in the department of the Roer; 21 miles S. of Juliers.

REICHENSTAIN, Unter, a town of Bohemia, in the circle of Prachatitz; 3 miles W.S.W. of Berg Reichenstein.

REICHENTHAL, a town of Austria; 3 miles E. of Haderdorf.

REICHENWALT, or Rieherswalde, a town of Pruffia, in Oberland; 4 miles N.W. of Liebsilat.

REICHERSDORF, a town of Transylvania; 4 miles E. of Medics.

REICHMANSHAUSEN, a town of the duchy of Wurzburg; 10 miles E.N.E. of Schweinfurt.

REICHNAY, a town of Bohemia, in the circle of Koniggratz; 17 miles E.S.E. of Koniggratz.—Alto, a town of Lufatt; 6 miles W. of Gorlitz.

REICHNICH, a town of the duchy of Stidia; 6 miles N.E. of Windisch Graätz.

REICOLDSGRUN, a town of Germany, in the principality of Cumbach; 2 miles S. of Kirch Lamitz.

REICHSHEFEN, a town of France, in the department of the Lower Rhine; 9 miles N. of Hagenau.

REICHSSTÄBER, in Commerce. See RIX-DOLLAR.

REICHTHAL, in Geography, a town of Silefia, in the principality of Breslau; 32 miles S. of Breslau. N. lat. 51° 50'. E. long. 17° 52'.

REID, Thomas, in Biography, an eminent divine and moralist, was born at Strachan, in Kincairdine-shire, of which parish his father was minister, in the year 1710. The elements of learning he received at the parish school of Kincairdine, after which he was sent to a classical school at Aberdeen; and so rapid was his progress in his studies, that about the age of thirteen he was found fully qualified for the university, and entered as a student in Marischal college. Here he distinguished himself by his proficiency in the various branches of learning taught during the usual course of four years, particularly in mathematics. At this period he probably took his degree of M.A., and afterwards commenced the study of theology, and in due time was licensed as a preacher. He was soon appointed librarian to the university, and became intimately acquainted with Mr. John Stewart, the professor of mathematics. This connection strengthened and confirmed his predilection for mathematical studies. Occasionally he read lectures for his friend, in which he discovered a happy faculty of making every thing intelligible to the students, which he clearly apprehended himself. In 1736 Mr. Reid resigned his situation of librarian, and accompanied Mr. Stewart on an excursion into England, and became acquainted with many illustrious characters in London, at Oxford, and at Cambridge. In the following year, Mr. Reid was presented by the King's college of Aberdeen to the living of New Machar; but his entrance into the functions of his office was very unpromising. His unwearying attention, however, to the duties of his office, the mildness and forbearance of his temper, and the active spirit of his humanity, soon overcame all their prejudices; and not many years afterwards, when he was called to a different situation, the same persons, who had taken a share in the outrages against him, followed him, on his departure, with their prayers and tears.
torns. "We fought," said one of them, "against Mr. Reid, when he came; and would have fought for him, when he went away."

The greater part of his residence at New Machar was devoted to the most intense study; and by way of amusement, he had recourse to gardening and botany, of which he was extremely fond, even in old age. In the year 1748 he published a paper in the Transactions of the Royal Society of London, entitled "An Essay on Quantity, occasioned by reading a Treatise, in which Simple and compound Ratios are applied to Virtue and Merit." The treatise here referred to was Dr. Hutcheson's "Inquiry into the Origin of our Ideas of Beauty and Virtue."

The professors of King's college, Aberdeen, in the year 1752, appointed Dr. Reid to be professor of philosophy: the choice originated wholly from the high opinion they were led to entertain of his talents and erudition. It is not known what particular plan he pursued in the course of his lectures; but his department comprehended mathematics, and physics, logic, and ethics. Soon after his removal to this situation, he projected, in conjunction with his friend, Dr. John Gregory, a literary society, which flourished many years, and which, it is believed, had considerable effect in exciting and directing that spirit of philosophical research, which has since so particularly distinguished the north of Scotland. The writings of Reid, Gregory, Campbell, Beattie, and Gerard, evince the numerous advantages which the members derived from this institution, as they were in the habit of bringing such works as they intended for publication to the tell of friendly criticism. Amongst these the most original was that of our author, published in 1764, entitled "An Inquiry into the Human Mind, or the Principles of Common Sense:" intended to refute the philosophy of Locke and Harteley, by denying the connection which they supposed to subsist between the several phenomena, powers, and operations of the mind; and accounting for the foundation of all human knowledge on a system of instinctive principles. About the time when this "Inquiry" made its appearance, the author received from the college of Aberdeen the degree of doctor of divinity; and by the university of Glasgow he was invited to the professorship of moral philosophy. On the duties attached to this office he entered in 1764; and he was enabled, by means of a handsome income, to concentrate all his attention to his favourite pursuits, which had hitherto been distracted by the miscellaneous nature of his academical engagements. The researches of Dr. Reid concerning the human mind, were extended and methodized in a course, which employed five hours every week, during six months in every year. The substance of these lectures was afterwards given to the world, in a more improved form, in the last of his publications. In the year 1773 appeared, in the form of an appendix to the third volume of lord Kames' "Sketches of the History of Man," a brief account of Arifotol's logic, with remarks by Dr. Reid. In the year 1781 Dr. Reid withdrew from his public labours, but he was not inactive; his subsequent works afford proof of the affluence with which he availed himself of his literary leisure. In 1785 he published his "Essays on the Intellectual Powers of Man"; and in 1788, those "On the Active Powers." These volumes complete the system of philosophy, begun in his "Inquiry" many years before.

Notwithstanding his advanced age, Dr. Reid continued to prosecute his studies with unabated ardour and activity. The modern improvements in chemistry attracted his particular notice, and he applied himself with his accustomed diligence to the study of its theories and nomenclature. He amused himself also, at times, in preparing for a philosophical society, of which he was a member, short essays on particular topics, which happened to interest his curiosity, and on which he thought he might derive or afford useful hints in the course of friendly discussion. His last essay appears to have been written in the 86th year of his age, and was read by the author to his associates but a short time previously to his death. In the month of September 1796, he was seized with a violent disorder, with which he for some time maintained a severe struggle; but which, together with some paralytic attacks, put an end to his useful life on the 7th of October, in the 87th year of his age. In point of bodily constitution, few men have been more indebted to nature than Dr. Reid. His form was vigorous and athletic, and his countenance was strongly expressive of deep and collected thought; but when brightened up by the face of a friend, what chiefly caught the attention was a look of good will and of kindness. The most prominent features of his character were intrepid and inflexible rectitude, a pure and devoted attachment to truth, and an entire command over his passions. In private life, no man ever maintained more eminently or more uniformly, the dignity of philosophy; combining with the most amiable modesty and gentleness, the noblest spirit of independence. As a public teacher, he was distinguished by unwearied industry in incalculating principles, which he conceived to be of essential importance to human happiness. In his elocution and mode of instruction, there was nothing peculiarly attractive. Such, however, were the simplicity and peripety of his style; such the gravity and authority of his character, that he was always listened to with profound respect, and, in his latter years, with a veneration, which age added to great wisdom always inspires. Stewart's "Life of Reid."

REIDEN, in Geography, a town of Switzerland, in the canton of Lucerne; 18 miles N.N.W. of Lucerne.

REJECTIO, a word used by medical authors for the cutting any thing up preternaturally by the mouth, whether it be by vomiting or by spitting.

REIFF, in Geography. See RIVA.

REIFFERSCHEID, a town of France, in the department of the Sarre, and chief place of a canton, in the district of Prum. The place contains 311, and the canton 3542 inhabitants, in 45 communes.—Auro, a town of France, in the department of the Rhine and Moselle, capital of a county in the archbishopric of Cologne; 42 miles W. of Coblenz. N. lat. 50° 33'. E. long. 6° 27'.

REIFFLING, a town of the duchy of Stiria, on the river Enns; 28 miles N.W. of Pruck.

REIFFNITZ, a town of Middle Carniola; 4 miles N. W. of Gottschew.

REITENBERG, a town of Austria; 59 miles S.E. of Goritz.

REIGELSBORG, a lordship of the duchy of Wurzburg.

REIGNAC, a town of France, in the department of the Gironde; 9 miles N.E. of Blaye.

REIGNIER, a town of France, in the department of the Léman, and chief place of a canton, in the district of Geneva. The place contains 1280, and the canton 9046 inhabitants, on a territory of 1025 kilometres, in 14 communes.

REIGNING WINDS, in Meteorology, are those winds which usually prevail in any particular coast or region, the knowledge of which is essentially necessary to every pilot, who is charged with the navigation in those seas.

REIKENES, in Geography, a cape on the S. coast of Iceland. N. lat. 63° 43'.

REIKEVIG,
REIKEVIG, a sea-port town of Iceland, consisting of about 60 or 70 houses, standing in two rows of nearly equal length, at right angles to each other, the high street being encumbered with rock. Among these rocks, which on every side surround the town, are scattered wretched hovels, a little raised above the level of the ground. The adjacent country much resembles the summits of some of the highest mountains in Scotland, being composed of fragments of rocks, and presenting only a few patches of alpine vegetation. Almost all the hovels of Reikevig are of Norwegian construction, and inhabited by Danes. The women of this town are principally employed in the operation of drying fish. On the little island of Arkarv, near this town, are bred eider ducks in great numbers. About six miles to the south of Reikevig is an immense bed of lava, extending a length of 25 miles, and having its black and detrital surface broken into maffles and fragments, which render it difficult and dangerous to traverse it, especially where quantities of the "tricholomum" conceal the hollow parts from view. The breadth of this remarkable current varies from two to ten miles; and its hideously shattered aspect is supposed to have resulted from the expansive force of elastic fluids which escaped during the cooling of the lava. Most of the produce of the Icelanders is brought to Reikevig; and the inhabitants of the interior of the country take back, in exchange for their tallow and skins, the dried heads of the cod-fish, and such fish as are injured by the rain and not fit for exportation. These form the principal article of their food, and are eaten raw, with the addition of butter, &c. Bishop Videlerin in this place has a library of 5,000 volumes. The author of the work now cited states the height of Hecla at about 5000 feet, and the population of Iceland at about 48,000 persons, who, from the rigour and inhability of their climate, can never rely on their native produce even for the necessary articles of subsistence. The principal articles of export are dried fish, (especially cod of a superior quality), mutton, lamb, beef, tallow, tallow-oil, coarse woollen cloth, the skins of sheep, lambs and foxes, cider-down and feathers; and their chief imports are timber, fishing tackle, various implements of tin, tobacco, bread, spirituous liquors, salt, linen, &c. A large proportion of their food consists of fish, butter, and various preparations of milk. Hooker's Journal of a Tour in Iceland in 1869.

REILLANE, a town of France, in the department of the Lower Alps; 5 miles S. of Forcalquier.

REIMBURSEMENT, in Commerce, the act of repaying or returning what monies a person has received, by way of advance, &c. or what another has disbursed or paid for him. A person who gives a bill of exchange in payment, is to reimburse it, if it come to be protested, for want of being accepted or paid.

REIMBURSING is also used for paying the price a commodity costs its owner.

REIMS, or Rheims, in Geography, one of the most ancient and celebrated cities of France, and principal place of a dioclet, in the department of the Marne, seated on the Vesle. Before the revolution this city was the see of an archbishop, who was the first duke and peer of France, and always crowned the king. In this place was the abbey of the Benedictines of St. Remy, the noblest of that order in the kingdom of France; and on the altar of its church, under which St. Remigius was buried, was kept the holy vial, which, as tradition reports, was, in the year 496, at the baptism of Clovis by bishop Remigius, brought from heaven by a dove in deference to the prayer of that saint; the crowd obstructing his passage to the font with the usual oil. The university of Reims was founded in 1547, and in the following year authorized by the parliament of Paris. This city contains 30,000 inhabitants, in the three parts into which it is divided, and it has three corresponding cantons, the first containing 13,140, the second 10,107, and the third 10,874, in three, four, and five communes respectively, on a territory of 117½ kilometres. Rheims carries on a considerable trade in wine, woolen and silk fluffs, and gingerbread. It has several remains of Roman antiquities, particularly the three gates of the city, which still bear the names of as many pagan deities, viz. the Sun, Mars, and Ceres. It was taken by the English in the reign of Henry V. N. lat. 49° 15'. E. long. 4° 6'.

REIN, a town of the duchy of Stiri; 9 miles N.W. of Graz. - Allo, a town of the same duchy, on the river Save; 20 miles E. of Ciciley.

REINDORFF, in Geography, a town of Bavaria; 4 miles S.S.W. of Bamberg.

REINECCIUS, Reiner, in Biography, a learned German, who flourished in the 16th century, was a disciple of Melanchthon, and taught the belles lettres in the universities of Frankfort and Heilmandt till his death, in 1595. He is known to the learned world by several works on history and genealogy, in which he was profoundly versed. His chief publications are, "Syntagma de Famulis Monarchiarum trium priorum," 1574; "Famili Regum Judaeorum;" "Chronicon Hierofolymitanum;" "Historia Orientalis;" "Historia Julia," three vols. folio; "Methodus Legendi Hilariam."

REINECK, in Geography, a town of France, in the department of the Rhine and Mofelle, late capital of a burggravey, deriving its name from it, and situated between the duchy of Juliers and electorate of Cologne, on the borders of the Rhine; 14 miles N.N.W. of Coblentz.

REINEN. See REINE.

REINERTZ, a town of Silesia, in the comte of Glatz, on the borders of Bohemia; famous for its manufactures of beautiful cloth and plait, and excellent paper, equal to the best in Holland; 11 miles W. of Glatz. N. lat. 5° 14'. E. long. 16° 10'.

REINFELDT, a town of Pfalz, in the province of Pomeelia; 12 miles S.W. of Dantzic.

REINFORCE, in Gunneroy, is that part of a gun next to the breech, which is made stronger, to resist the force of the powder. There are generally two reinforcements in each piece, called the first and second reinforcement; the second is somewhat smaller than the first, upon the supposition that when the powder is inflamed and occupies a greater space, its force is diminished, which is very absurd. See CANNON.

REINFORCE Rings of a cannon, are flat mouldings like iron hoops, placed at the breech-end of the first and second reinforcement, projecting beyond the rest of the metal about one-fourth of an inch. See CANNON.

REINFORCEMENT, in War, a supply, or new provision of men, arms, ammunition, &c.

REINGUS, in Geography, a town of Austria; 12 miles N.W. of Waidhoven.

REINHARTSBRUNN, a town of Austria, in the principality of Gotha; 10 miles S.S.W. of Gotha.

REINHARTZ, a town of Saxony; two miles W. of Schmiedeburg.

REINHEIM, a town of the principality of Hesse Darmstadt; 5 miles S.E. of Darmstadt.

REINHOLD, Erasmus, in Biography, an eminent German mathematician, was born at Salzfeld, in Thuringia, a province in Upper Saxony, in the year 1511. He was educated
educated at the university of Wittemberg, where his genius
chiefly inclined him to the study of the mathematics, which
he cultivated with great success. He afterwards became a
professor of those sciences in the same university, and ac-
quired very high reputation, not only by his lectures, but
by the learned and useful writings which he communicated
to the public. Of these, which are very numerous, we
may mention "Theoriz Novae Planetarum G. Purbachii," aug-
mented and illustrated with diagrams and scholia.

"Ptolemy's Almagest, with a Latin Version, and Scholia." In
1551 he published "Prutenica Tabulae Celestae Moti-
tum," which were several times reprinted. In carrying on
this work, which cost seven years' labour, he was encour-
aged by the munificence of Albert, duke of Prussia. They were
contructed by him from a comparison of the observations of
Copernicus with those of Ptolemy and Hipparchus, and he
has fully explained the use of them in a great number of
precepts and canons, forming a complete introduction to
practical astronomy. Reinhold also made many astronomical
observations, but he never had any better instrument
than a wooden quadrant. The result of these observations
were shewn to Tycho Brache after the death of Reinhold,
who expressed his surprize that so great and meritorious a
cultivator of astronomical science was not furnished with
better instruments. Reinhold died in 1553, when only in
the 42d year of his age, announcing the following verse
a short time before he expired.

"Vixi, et quem dederas cursum milii, Cirithus, peregi." He
had a son of the same name, eminent as a mathematician
and physician, who published a small work in the German
language "On Subterranean Geometry;" also a tract con-
cerning the new star which appeared in Cassiopeia in 1572.

REINSCHDORF, in Geography, a town of Silegia,
in the principality of Neile; 5 miles N. of Neile.

REINS, in Anatomy, the kidneys. See KIDNEY and
RENES.

The word, according to Varro, is formed from the
Greek, ἱφος, quasi rivo obiecti humoris ab isti orientur.—The
Greeks call the rein ρησία from the verb ρησεῖι, to rain,

snow, &c.

In the manner they fly, a horse should have double reins;
that is, he should have them a little more elevated on each
side of the back-bone, than upon it; so that, passing your
hand along it, you find it large, well-furnished, and double,
by the hollow that goes all along the back-bone. The
back should be firm and not hollow, or bending from the
withers to the croup, but straight.

REINS, of a bridle, also denote two straps of leather
meeting in the bridle-hand of the horsemann, in order to make
the bit bear, and keep the horse under subjection. See BRIDLE.

It is also a name given by the duke of Newcastle to two
straps or ropes of a cavalier, which he ordered to be made
fast to the girths, or the pommel of the saddle, with intent
that the rider should pull them with his hand, in order to
bend and fupple the neck of the horse.

REIN, Falte, is a lath of leather, passed sometimes through
the banquette, to bend the horse's neck, which is disappro-
ved of by the duke of Newcastle, because it flacks the curb,
and makes the bit no more than a trench that has no
curb.

REINS, in Rural Economy, the long thongs or strips
of leather, or other materials, by which horses or other
animals are directed in carriages or teams. These reins are much
used in some counties, as Norfolk and Suffolk, in directing
the plough-teams, in order to fave the expense of another
person, the ploughman directing them in this way himself;
the driver being by this means dispenc'd with.

REINS, Check, a term signifying the same thing as a fort
of reins, and which is made use of in particular districts, in
checking and directing the animals.

REINS, Whip, a term used to signify a fort of hempen
reins, employed for directing the team in ploughing in some
districts, to called in consequence of being used instead of
whips.

REINS of a Vault. See VAULT.

REINSBERG, or RHINBERG, in Geography, a town
of Brandenburg, in the Middle Mark; 10 miles N.E. of
New Ruppin. N. lat. 53° 41'. E. long. 12° 58'.

REINSCHNICK, Der, a mountain of Storia; 12 miles
S.E. of Landberg.

REINSDORF, a town of Saxony, in the circle of
Erzgetirg; two miles E.S.E. of Zwickau.

REINSBURG, a town of Bavaria, in the territory of
Rothenburg; six miles S.S.W. of Rothenburg.

REINSTATING, the restoring of a perfon or thing to
its former state or condition, from whence it had been
disurbed or displaced. See REHABILITATION.

REINSTEIN, in Geography. See Regenstein.

REINSURANCE, or Re-Assurance, in Commerce,
a contract by which a first insurer relieves himself from the
risks which he has undertaken, and devolves them upon other
under-writers, called re-insurers, or re-avers. When a
policy of insurance has been once signed, the under-writers are
bound by the terms of it; nor can they be released from their
contract without the consent of the insured. But if an
under-writer repents of what he has done; if he be afraid to
encounter the risk which he has engaged to run; or if he
find that he has incautiously engaged himself to a greater
amount than he may be able to discharge, he may shift it,
or part of it, from himself to other insurers, by causing a re-
insurance to be made on the same risk, upon the behalf in
his power, and the new insurers will be responsible to him in
case of losses, to the amount of the re-insurance. But in
such case, the new insurers are responsible to the original
under-writer only, and not to the original insured, who can
have no remedy against him, in case of losses, even though
the original insurer become insolvent; because there is
no privity of contract between the original insured and the
re-insurer. If, therefore, the original insurer fail, so that the
original insured receive only a dividend, however small, the
re-insurer can gain nothing by this, but must pay the full
amount of the losses to the original insurer. Such is the law
on this subject, in most of the commercial states of Europe.

But in this country it was found, about the time when the
Statute 19 Geo. II. c. 17. was made, that this mode of
insurance, though perfectly reasonable, when confined to its
proper object, had been perverted from its original use, and
was employed as a mode of speculating in the rise and fall of
premiums; and the legislature foreseeing that it might be
used as a colour for wager policies, and a means of evading
the provisions of that act, declares ( sect. 4.) "that it shall
not be lawful to make re-insurance, unless the insurer shall
be insolvent, become bankrupt, or die; in either of which
cases, such insurer, his executors, administrators or assignees,
may make re-insurance to the amount of the sum before by
him insured; provided it be expressed in the policy to be a
re-insurance." This clause, having no words to confine its
operation to ships belonging to British subjects, like the
first clause of the act restraining insurances, inter alia or no inter-
rejts, extends to re-insurances made in England in foreign
ships, even when they are insured abroad. This has been so determines; though it is observable that the following cafe, in
which
which that question was made, was not the species of re-insurance above described, and to which only the statute refers, but a second insurance, effected on account of the original in-

jured.

That was the case of an insurance made in London, on a French vessel, which had before been insured at Marseilles for the same sum, by an insurer there, who, at the time of subseribing the second policy, was living and solvent, and who, in fact, afterwards paid the sum insured by him. Upon this case the court determined that the latter policy was void by the words of the act; for though the first clause of the act which prohibits insurances, 'interest or no inter-

est,' is confined to insurances on British ships, yet the fourth section being general, and without any such restrictive clause, every re-insurance in this country, either by British sub-

jects, or foreigners, on British or foreign ships, is declared void by the statute, unless the first insurer be insolvent, be-

come bankrupt, or die.

There are two other kinds of re-insurance; the one where the insured insures the solvency of the insurers; the other, where he makes a new insurance, in consequence of the insolv-

ency of an insurer during the continuance of the risk.

The insurance of the solvency of an insurer is permitted and practised in some foreign countries; but it seems never to have been in use among us; not, perhaps, as has been supposed, because the solvency of an under-writer is not an insurable interest, or that such an insurance would be deemed a wager; but, more probably, because the insolvency of an insurer seldom happens in England; besides, a double in-

surance would better answer the end proposed.

If France, if an insurer fail during the continuance of the risk, the insured may infil on the dissolution of the con-

tract, unless the creditors of the insolvent insurer, in order to entitle themselves to receive the premium, (which is rarely paid in that country till after the risk is ended,) will give se-

curity for the payment of the sum insured, in case of loso. At Marseilles, (for in France different practices prevail in different provinces,) the insured, in such case, fuses the insol-

vent insurer, till he obtains a sentence, authorizing him to re-insure at the expense of the insolvency, which he may de-

duce from the stipulated premium, if it be not paid, and if this be insufficient, then out of the effects of the ins-

olvent.

Double insurance is where the insured makes two insurances on the same risk, and the same interest; and it differs from a re-insurance in this, that it is made by the insured, in order that he may be entitled to receive a double satisfaction, in case of loso; whereas, a re-insurance is made by a former insurer, his executors or assignees, to protect himself and his estate from a risk to which they were liable by the first in-

surance. A re-insurance, except in the cases permitted by the statute 'interest or no interest,' is absolutely void; but a double insurance, though it be made with a view to a double satis-

faction in case of loso, and is therefore in the nature of a wager, is not void by the law of England. The two poli-

cies are considered as making but one insurance. They are good to the extent of the value of the effects put in risk; but the insured shall not be permitted to recover a double satis-

faction. He may sue the under-writers on both the policies, but he can only recover the real amount of his loso, to which all the under-writers shall contribute in proportion to their several subscriptions. And therefore, if he should content himself with suing only on one of the policies, the under-writers on that policy may recover a rateable contribu-

tion from those on the other.

In consequence of the determination of lord Mansfield, in 1763, it has been agreed to be the course of practice, that, upon a double insurance, though the insured is not entitled to two satisfactions, yet, that in an action upon the first policy, he may recover the whole sum insured, and may leave the de-

fendants therein to recover a rateable satisfaction from the other insurers. Formerly, in the case of an over-insurance, that is, where, in a single policy, the sums subscribed amount to much more than the value of the effects insured, the first under-writers on the policy were held to be answer-

able to the extent of the loso, and the subsequent ones dis-

charged. Although only a single satisfaction can be recov-

ered on a double insurance by the same person, yet different per sons may insure the same thing, and each recover the full value of the thing insured. To enable the defendant, in an action on a policy, to discover whether there be a double insurance, he may, by the authority of the statute 19 Geo. II. c. 37. § 6, call upon the plaintiff to declare in writing, what sums he has insured in the whole, and how much he has borrowed on bottomry or respondencia. Mar-


REINTAL, in Geography, a town of Austria; four miles E.S.E. of Feldberg.

REINTEGRATION. See Redintegration.

REJOINING FIRE, in Military Affairs, is used on ob-

taining a victory, or in celebrating some public festival: of this there are two sorts, viz. one by a volley, and the other by a running fire, from the right to the left of the battalion or line.

REJOINER, in Law, the defendant's answer to the plaintiff's replication.

The order of the court of chancery is thus: first, the defendant puts in an answer or plea to the plaintiff's bill, which is sometimes also called an exception; the plaintiff's an-

swer to this is called a replication; and the defendant's an-

swer to that, a rejoinder.

The plaintiff may answer the rejoinder by a fur-rejoinder, upon which the defendant may rebut; and the plaintiff may an-

swer him by a fur-rebutter; which pleas, replications, re-

joiners, fur-rejoinders, rebutters, and fur-rebutters, an-

swer to the exceptio, duplicatio, triplicatio, and quadruplicatio of the Roman laws. See Pleading.

REJOINING, or Rejoyning, in Architecture, the filling up of joints of the stones in old buildings, &c., when worn hollow by the course of time, or by weather.

Rejoinning is to be performed with the best mortar, as that of lime and cement; sometimes also with plaster; as in the joints of vaults, &c.

REIPOLTZHEIM, in Geography, a town of the duchy of Wurzburg; three miles N.E. of Schwarzbach.

REIPOLTZKIRCHEN, a castle of France, in the department of Mont Tonnerre, which gave name to a lord-

ship, situated in the Hunfruck; five miles E. of Lauterbeck.

REIS, Re, or Rei, in Commerce. See REES.

REIBACH, in Geography, a town of Lower Bavaria, in the Vils; 35 miles W. of Passau.

REICH, a town of Moravia, in the circle of Igla; 18 miles S. of Igla.

REICH, a town of Bohemia, in the circle of Boleflau; two miles N.W. of Nimes.

REISE-ENNENDI, in the Turkish Empire, one of the ten members of the divan, (which see,) or council of the grand vizir, of which the vizir and mutthis are the presidents. The reis-ennendi is a kind of secretary of state, high chan-

cellor of the empire, and minister for foreign affairs. He signs all the orders of the Porte, which do not directly con-

cern the finances and the military operations; he treats with all the European ministers who are at Constantinople: in a word, every thing that concerns the foreign powers, and
every thing that relates to the interior administration, pafs
through the channel of the reis-effendi; but he does nothing
without communicating it to the grand vizir, and taking his
orders. In this council there are also two ex-reis-effendi.

REISENBERG, in Geography, a town of Austria, on
the Reifenbach river; 12 miles S.E. of Vienna.

REISENBERG, a town of Prullia, in the province of
Oberland, built in the year 1169, and anciently the rei-
dence of the bishops of Pomerania. The chief subsi-
dence of the inhabitants is derived from brewing and
agriculture; near it is an ancient cable; 78 miles S.W. of König-
berg.

REISENCEBERG, a town of Bohemia, in the circle
of Koningsgratz, N. lat. 50° 40'; E. long. 15° 30'.
REISENPACH, a river of Austria, which runs into
the Danube; 12 miles below Vienna.

REISHEFFEN, a town of France, in the department
of the Lower Rhine; 21 miles N. of Strasbourg.

REJSDARVI, a town of Sweden, in the government
of Uleaa; 47 miles E. of Gama Karleby.

REJSKE, John James, in Biography, a learned phy-
losoph, born in 1716, at Zorlra, in Milna, was the fon of a
tainer in that place. He was, at the age of twelve, sent
to the orphan-school at Halle, where he made a rapid pro-
gress in the learning of the language. In 1733 he entered at
the university of Leipzig, and being destined for the theological
profession, he spent five years chiefly in the study of rabbi-
nical writings, and in the study of the Arabic language.
To the latter he became so ardently attached, and his pas-
fion for Arabic books was so strong, that he almost deprived
himself of necessaries to purchase them. He went to Holl-
land with the view of improving himself in his favourite
language, and while there, he ranstreated all the Oriental
treasures of the library at Leyden, while, for his subsistence,
he was obliged to become a corrector of the press. He
passed his time in a state of indigence that brought upon
him hypochondria affections, the effects of which never left him.
During his residence at Leyden, he was prestanted
with a gratuitous degree in phyicse, but he never intended to
avail himself of it in the way of practice. "Poverty," says
his biographer, "was his perpetual companion, and his
scanty resources were derived from correcting the pre,
translating, and performing other tasks for bookfellers."

Many learned pieces in Oriental and Greek literature occa-
ionally proceeded from his pen, which made him well known
in the learned world: and several of the works edited by him
are held in very high estimation. He was at last nominated
rector of the college of St. Nicholas, in Leipzig, a situation
which enabled him to purifie his literary labours more ac-
gording to his inclination. At the age of forty-eight he
married Elzabeth Muller, a young woman of twenty-five,
who, under his instructions, acquired so much knowledge,
of the Greek and Latin, and some modem languages, that he
became extremely useful to her husband in his editorial
employments. He died at the age of fifty-eight, in the year
1774. Of the most valuable works of Reiske, are "Differ-
tatio de Principibus Muhamediani qui aut ab Eridutiae aut
at Amore Literarum inclaruerunt?" "Animadversiones in
Sophoclem?" "Animadversiones in Aesores Gracios?"
"Oratorum Greecorum?" 8 vols.; "Plutarchi Opera omnia?"
"Maximi Tyrii Differt?" "Apparatus Critici ad Demof-
thoneum?" 3 vols. And after his death were published his
4. "Conjecturae in Jobum et Proverbia Salomonis, cum Or-
ator de Studio Arabico Linguae." The "Acta Erudito-
rum?" were much indebted to the pen of Reiske.

REISNITZ, in Geography, a town of the duchy of
Cohns, four miles N.W. of Gottfheec.

REISSENDORF, a town of Sileia, in the principality
of Neife; four miles N. of Pathkau.

REISTEN, a town of the duchy of Wurzburg; six
miles N.N.E. of Arnttein.

REISTERSTOWN, a post-town of America, in
Baltimore county, Maryland; ten miles S.E. of Wef-
milner.

REITERED GRAFTING. See GRAFTING.

REITERATING, in Printing. See Printing.

REITERATION, the act of repeating a thing, or
doing it a second time.

The church does not allow of the reiteration of baptism.
St. Gregory observes, that it is no reiteration when there
are wanting proofs of the thing's having been regularly done
before.

REITLENGIN, in Geography. See Reutlengin.

REITTERECK, a town of Stiria; seven miles E. of
Voitzburg.

REITTERS, an ancient title given the German cavalry.
The word is originally High Dutch, and signifies a horse-
man, cavalier, or even knight.

REITZ, in Geography, a town of Portugal, in the pro-
vince of Beira; three miles N. of Vifeu.

REJKEK, a small island in the East Indian sea. S. lat.
1° 33'. E. long. 128° 40'.

RELALS, in Fortification, a French term, the same with
herrms.

RELAND, Adrian, in Biography, an eminent orien-
 talist and polite scholar, was born in the year 1676, at
a village in North Holland. He was educated at Amsterdam,
and made such progress in learning, that, having gone
through the usual classical course when he was only eleven
years old, he employed the next three years in making him-
self acquainted with the Hebrew, Syriac, Chaldee, and
Arabic languages. At the age of fourteen he was sent to the
university at Utrecht, and in three years was admitted to
the degree of doctor in philosophy, and on this occasion
he fulminated a thesis "De Libertate Philofoophandi." After
a residence of six years at Utrecht he removed to Leyden,
and was in a short time chosen by the earl of Portland as
preceptor to his son. At the age of twenty-four, the univer-
sity of Hardervyk nominated him to the chair of philo-
osophy, but he did not remain long in that situation, for
the university of Utrecht, on the recommendation of king
William, invited him to the professorship of the Oriental
languages and Jewish antiquities, which he accepted, and oc-
cupied with high reputation during the remainder of his life.
He died at the age of 43, in the year 1719. Few writers
have met with more general applause than Reland. His
principal works, which are all extremely valuable, are;
2. "Difertationes de nummis veterum Hebraorum."
3. "Antiquitates sacre veterum Hebraorum." 4. "In-
tructionis ad Grammaticam Hebraicam." 5. "De Spolii-
tem Thraciorum Historia, in Arcu Titiano Romae compi-
cus." 6. "De Religione Muhamedica." Besides these
he published many other things. In private life he was dif-
guished by his modesty, humanity, and learning, and
carried on a correspondence with the most eminent scholars
of his time. Moreri.

RELAPSE, in Medicine, the recurrence of a disea-
s during the period of convalescence.

Reaples of all diseases, whether acute or chronic, are
deemed more dangerous than the original attack; because
the constitution, being already debilitated and reduced by
the previous ills, is less capable of resisting the farther
ravages of disease. This may be said to be true of all acute
diseases,
diseases, such as fevers, dysenteries, inflammations of the lungs, liver, &c. Nevertheless, relapses of these disorders are not always fatal; because, as the weaker constitution is less capable of being excited to violent action, so these second attacks are sometimes milder, and more easily influenced by remedies. Relapses of chronic diseases, such as dropsies or jaundice, are more unfavourable; because their recurrence implies that the internal disease, from which they originate, is not removed, but has only been temporarily alleviated.

**RELATIO**, Lat., **Relation**, Eng., in **Music.** Relative sounds are in general such as belong to two or more chords, as in the key of C. The chords of A, F, G, and E, are relative chords; as E, the 4th of A, is 3d of C; in the chord of F, C is the 5th; in the chords of G and E, each of those sounds is a part of the chord of C.

![C major chord](image)

The relatives to A minor are obvious here.

In the modulation by rising and falling a 3d in the base, two relative notes are in common with each chord. The most agreeable relation of a minor key to a major, is in the modulation from a minor key to the 3d above; as from A to C, or D to F; the scales of both keys being the same in descending. But falling a 3d in the base from a minor 3d to a major, as from A to F, or from D to B♭, is still more pleasing.

False relation is C in against C, or G in the chord of C. But even these false relations are allowed now, as passing-notes of taste, though not in the body of the harmony.

**RELATION, RELATIO,** in **Philosophy,** the mutual respect of two things; or what each is with regard to the other.

The word is formed *a referendum*: relation confining in this, that one thing is referred to another; whence it is also called respect, habitude, and comparison.

The idea of relation we acquire, when the mind so considers any thing, that it doth, as it were, bring it to, and fet it by, another, and carry its view from the one to the other. Hence the denominations given to things intimating this respect, are called relatives; and the things so brought together, are said to be related.

Thus, when I call Caius husband, or this wall abiter, I intimate some other person or thing in both cases, with which I compare him or it. Hence the wall is called by the schoolmen the subject; the thing it exceeds in white-nefs, the term; and the whitenefs, the foundation of the relation.

Relation may be considered two ways; either on the part of the mind referring one thing to another; in which sense, relation is only a mode or affection of the mind, by which we make such comparison; or on the part of the things referred, which being no other than ideas, relation, in this sense, is only a new idea resulting or arising in the mind upon considering of two other ideas. So that relation, take it as you will, is only in the mind, and has nothing to do with the things themselves.

Any of our ideas, Mr. Locke observes, may be the foundation of relation. Though where languages have failed to give correlative names, the relation is not easily taken notice of; as in conjoining, which is a relative name, as well as wife.

There is, in effect, no idea but is capable of an infinite number of relations: thus, one single man may at once sustain the relations of father, brother, son, husband, friend, subject, general, European, Englishman, husband, master, servant, bigger, lesser, &c. to an almost infinite number; he being capable of as many relations as there can be occasions of comparing him to other things in any manner of agreement or disagreement, or any respect whatsoever.

The ideas of relations are much clearer and more distinct than those of the things related; because the knowledge of one simple idea is oftentimes sufficient to give the notion of a relation; but, to the knowing of any substantial being, an accurate connection of several ideas is necessary.

The perception we have of the relations between the various ideas in which the mind acquiesces, makes what we call judgment. Thus, when I judge that twice 2 make 4, or do not make 5, I only perceive the equality between twice 2 and 4, and the inequality between twice 2 and 5.

The perception we have of the relations between the relations of various things, constitutes what we call reasoning. Thus, when from this that 4 is a smaller number than 6, and that twice 2 is equal to 4, I gather, that twice 2 is a less number than 6; I only perceive together the relation of the numbers twice 2 and 4, and the relation of 4 and 6.

The ideas of cause and effect, we get from our observation of the vicissitude of things, while we perceive some qualities or substances begin to exist, and that they receive their existence from the due application and operation of other beings. Which that produceth, is the cause; that which is produced, is the effect.

Thus, fluidity in wax is the effect of a certain degree of heat, which we observe to be constantly produced by the application of such heat.

The denominations of things taken from time are, for the most part, only relations. Thus, when it is said, that queen Elizabeth lived sixty-nine, and reigned forty-five years, no more is meant, than that the duration of her existence is equal to sixty-nine, and of her government to forty-five, annual revolutions of the sun; and so are all words answering to how long.

Young and old, and other words of time, that are thought to stand for positive ideas, are indeed relative, and intimate a relation to a certain length of duration, of which we have the ideas in our minds. Thus, we call a man young or old, that has lived little or much of that time which men usually attain to: and thus a man is called young at twenty, but a horse old at the same period.

There are other ideas that are truly relative, which we signify by names that are thought positive and absolute; such as great and little, strong and weak. The things thus denominated
Authors give various divisions of relations. The school philosophers commonly divide them into those of origination, under which are comprehended the relations of cause and effect; those of negation, which are between opposite things; and those of affirmation, which are relations of agreement between whole and part, the sign and thing signified, the adjunct and subject. This division is founded upon this, that the mind can only compare things three ways; viz. by inferring, denying, and affirming.

Others divide relations into those of origination; those of agreement, e. gr. similitude, parity, &c.; those of diversity; and those of orders, as priority, posteriority, &c.

Others divide them into predicamental and transeptal. Under the first come those relations between things that belong to the same predication, e. gr. between father and son. To the latter belong those which are more general than the predicaments, or are of different predicaments; as the relations of subsistence and accident; of cause and effect; and of Creator and creature.

Mr. Locke gives us a distribution of relations on a different principle. All simple ideas, he observes, in which are parts or degrees, afford an occasion of comparing the subjects in which they are to one another, in respect of those simple ideas; as whiter, sweeter, more, less, &c. These, depending on the equality and excess of the same simple idea, in several subjects, may be called proportional relations.

Another occasion of comparing things being taken from the circumstances of their origin, as father, son, brother, &c. these may be called natural relations.

Sometimes the foundation of confidering things is some act, by which any one comes by a moral right, power, or obligation, to do something: such are general, captain, burgler: these are instituted and voluntary relations, and may be distinguished from the natural, in that they are alterable and separable from the persons to whom they sometimes belonged, though neither of the substantiae so related be destroyed. But natural relations are not alterable, but are as lasting as their subjects.

Another relation is the conformity or disagreement of men's voluntary actions to a rule, to which they are referred, and by which they are judged of: these may be called moral relations.

It is this conformity or disagreement of our actions to some law (by which good or evil is drawn on us from the will and power of the law-maker, and is what we call reward or punishment) that renders our actions morally good or evil.

Of these moral rules or laws there seem to be three sorts, with their different enforcements. First, the divine law; secondly, civil law; thirdly, the law of opinion or reputation. By their relation to the first, our actions are either sins or duties; to the second, criminal or innocent; to the third, virtues or vices. Locke's Essay, vol. i. chap. 25, 26, 33.

Relation, in Logic, is an accident of substantiation, accounted one of the ten categories or predicaments.

Each substantia admits of an infinity of relations. Thus the name Peter considered with regard to Henry, is in the relation of a master; with regard to John, in that of a tenant; with regard to Mary, in that of a husband, &c. Again, with regard to one person, he is rich; with regard to another, poor; with regard to another, he is far, near, tall, short, a neighbour, stranger, learned, unlearned, good, bad, equal, &c. It is disputed among the school philosophers, whether or no the relation be a thing formally and really distinct from the foundation of the substantia.

Relation, Relation, in Rhetoric, is sometimes used to signify the name with recrimination; which fee.

Relation is also used, in the School Theology, to denote certain of the divine perfections, called personal ones; because these divine Person is referred to another, and distinguished from it.

Hence the schoolmen teach, that in God there is one nature, two proceedings, three persons, and four relations.

These relations are paternity, filiation, active spiration, and passive spiration.

Relation, in Geometry, Arithmetic, &c. is the habit, or respect of two quantities to one another, with regard to their magnitude. This we more usually called ratio or reason. See Ratio.

The equality or sameness of two such relations we call proportion; which fee.

Relation, in Grammar, is the correspondence which words have to one another in connection; which fee. See also Regimen and Syntax.

Faulty and irregular relations are the things chiefly to be guarded against in writing correctly; they make the sense obscure, and frequently equivocal. Thus: the orator was attended to with a coldness, which was the more remarkable, as the audience were under some emotion before he began. Here coldness be put indeterminately, the relation which can have no just and regular relation to it.

Relation is also frequently used for analogy, or what several things have in common. See Analogy.

In painting, architecture, &c. a certain relation of the several parts and members of the building, or picture, constitutes what we call symmetry; which fee.

Relation, in Law, is where two things, as times, &c. are considered as if they were one; the thing subsequent being considered as taking effect, by relation, at the time preceding.

As if A deliver a writing to B, to be delivered to C; as the deed of A; the writing shall be deemed to be delivered to C, at the time when it was given to B, by relation.

When the execution of a thing is done, it hath relation to the thing executory, and makes all but one act to record, although performed at several times. (1 Rep. 199.) Judgment shall have relation to the first day of the term, as if given on that very day, unless there is a memorandum to the contrary; as where there is a continuance till another day in the same term. (3 Salk. 212.) A verdict was given in a cause for a plaintiff, and there was a motion in arrest of judgment within four days; the court took time to advise, and in four days afterwards the plaintiff died: it was adjudged, that the favor of the court shall not prejudice the party, for the judgment ought to have been given after the first four days; and though it is given after the death of the party, it shall have relation to the time when it ought to have been given. (1 Leon. 187.) Rule was had for judgment, and two days after the plaintiff died; yet the judgment was entered, because it shall have relation to the day when the rule was given, which was when the plaintiff was alive. (Popk. 132.) Judgment against an heir of the obligation of his ancestor shall have relation to the time of the writ rendered purchased; and from that time it will
will avoid all alienation made by the heir. (Croy. Car. 102.)
If one be bail for a defendant, and before judgment he leaves his lands; they shall be liable to the bail, and judgment by relation.

By Stat. 29 Car. II. c. 3. § 16. writs of execution shall bind the property of goods taken in execution, only from the time of their delivery to the officer. Sale of goods of a bankrupt, by commissioners, shall have relation to the fifth act of bankruptcy; and be good, notwithstanding the bankrupt sells them afterwards. (Stat. J. c. 15.) If a man buys cattle in a market, which are stolen, and sells them out of the market, though the cattle are afterwards brought into the market, and the second bargain confirmed, and money paid, &c., this bargain will not be good; for it shall have relation to the beginning, which was unlawful. (Dyer 90.) Fines, being but common aflurances, shall be guided by the indentures precedent; and the execution of them have relation to the original act. (Croy. J. 110.) Letters of administration relate to the death of the intestate, and not to the time when they were granted.

So bills in parliament to which the king assents on the last day of parliament, shall relate and be of force from the first day thereof. Coke calls this fìlét jùris.

RELATION, in Mytjc. See RELATIO.

RELATIVE PROPOSITIONS, are such as include some relation and comparison. Thus, where the treasure is, there will the heart be; As much as thou haft, so much thou art worth, &c. are relative propositions.

RELATIVE gravity, levity, motion, necessity, place, space, time, velocity. See the several subtantives.

RELATIVE Terms, in Logic, are words which imply a relation, or a thing considered as compared to another.

RELATIVE TERMS include a kind of opposition between them; yet so, as that the one cannot be without the other.

Such are father and son, husband and wife, king and subjects, &c.

RELATIVE, in Grammar, is a word or term, which in the construction answers to some word foregoing, called the antecedent; which fee.

All relatives are said to reciprocate, or mutually infer each other; and, therefore, they are often expressed by the genitive case.

RELATIVE Pronoun. See PRONOUN.

RELATOR, in Law, a rehearser, or teller, applied to an informer. See INFORMATION.

RELAXATION, in Law, is used for a relieving. See RELEASE.

In this sense, we say the relaxation of an attachment in the court of admiralty.

The tenor of indulgence is a relaxation, or a diminution, of the pains of purgatory.

RELAXATION, in Surgery, is a preternatural extension, or straining of a nerve, tendon, muscle, or the like; either through violence or weakens.

Hernias are defects or relaxations of the intestines, &c. From the fame caufe arise defects or prolapses of the anus, &c.

RELAY, a fresh equipage, horse, &c. sent before, or appointed to be ready, for a traveller to change, to make the greater expedition; as in riding post.

The term is borrowed from the French, relais, which signifies the same thing. In France, the general of the posts entitles himself superintendent of the relays.

RELAY Horse, in the Artillery, are horses that march with the artillery or baggage, and are ready to relieve others, or to affilt in going up a hill, or through bad roads, &c.

RELAYS, in Hunting, are fresh sets of dogs, or horfes, or both, dispersed here and there for readines, in cafe the game come that way, to be call'd off, or to mount the hunters in lieu of the former, which are suppos'd to want repite.

RELAY, in Tapercry, is an opening left in a piece of tapercry, where the colours or figures are to be changed; because on those occasions the workmen are changed; or else the places are left to be filled up, till the rest of the work is done. See TAPERY.

RELEASE, RELAXATION, in Law, denotes an instrument, by which eftates, rights, titles, estries, actions, and other things, are sometimes extinguished and annulled, sometimes transferred, sometimes abridged, and even sometimes enlarged; and it is a species of conveyance which presupposes some other conveyance precedent, and serves to enlarge, confirm, alter, restrain, rescue, or transfer the interest granted by such original conveyance.

A release is either in fact or in law. A release in fact, is that which the very words do expressly declare.

A release in law, is that which accuits by way of consequence, or intendment of law. A release is the giving or discharging of a right of action, which a man hath claimed, or may claim, against another, or that which is his; or it is the conveyance of a man's interest or right which he hath to a thing, to another who hath possession of it, or some estate in it. (4 New Abr.) According to Coke releases are distinguished into express releases in deed, and those arising by operation of law; and are made of lands and tenements, goods and chattels; or of actions real, personal and mixed. (1 Inft. 204.) Releases of land may enure, or take effect, either, 1. By way of enlarging an eftate, or enlarging an estate; as if there be tenant for life or years, remainder to another in fee, and he in remainder releases all his right to the particular tenant and his heirs, this gives him the eftate in fee. (Litt. § 465.) But in this case the relefsee must be in possession of some estate, for the release to work upon; for if there be a lease for years, and, before he enters and is in possession, the leffer releases to him all his rights in the reversion, such release is void for want of possession in the relefsee. (Litt. § 459.) But when it is said, that a release, which enures by enlargement, cannot work without a possession, it must be understood to mean, not that an actual estate in possession is necessary, but that a "veiled interest" suffices for such a release to operate upon. By comparing this with the operation of a Lease and Release (which fee) it will be seen, that not only estates in possession, but estates in remainder and reversion, and all other incorporeal hereditaments, may be effectually granted and conveyed by lease and release; but it is an inaccuracy to say, that the relefsees are, in these cases, in actual possession of the hereditaments; the right expression is, that they are actually vested in him, by virtue of the lease in possession and the statute. 1 Inft. 270. (a) n. 3.

To make releases operate by enlargement, it is generally necessary, that the relefsee, at the time the release is made, should be in actual possession of, or have a veiled interest in, the lands intended to be released; that there should be a privity between him and the relefser, and that the possession of the relefsee should be notorious.

2. By way of paufing an eftate, or mitting an estate: as when one or two co-parceners releafeth all her right to the other, this pasteth the fee-simple of the whole.

(1 Inft.
REL

(1 Inft. 273.) And in both these cases there must be a privity of estate between the releflee and the releflee; that is, one of their estates must be so related to the other, as to make but one and the same estate in law.

3. By way of paying a right, or mettre le droit: as if a man be diftrefled, and releafeth to his diftrefee all his right; hereby the diftrefee acquires a new right, which changes the quality of his estate, and renders that lawful which before was tortious or wrongful. (Litt. § 466.)

4. By way of extinguishment: as if my tenant for life makes a lease to A for life, remainder to B and his heirs, and I release to A; this extinguishes my right to the reversion, and shall enure to the advantage of B's remainder as well as A's particular estate. (Litt. § 470.)

5. By way of entry and feefntment: as if there be two joint diftrefees, and the diftrefee releafes to one of them, he shall be folo feefnt; and shall keep out his former companion; which is the fame in effect as if the diftrefee had entered, and by that means put an end to the diftreflien, and afterwards had enfeofled one of the diftrefees in fee. (1 Inft. 278.) And, hereupon we may observe, that when a man has in himself the posfeffion of lands, he must at the common law convey the freehold by feefntment and livery; which makes a notoriety in the country: but if a man has only a right or a future interest, he may convey that right or interest by a mere releafe to him that is in posfeffion of the land: for the occu-pancy of the releafe is a matter of sufficient notoriety already. Blackil. Com. book ii. See LEASE and RELEAF.

Littleton says, that the proper words of a release are reminifce, relaffche, and quieten claffeffe," which have all the fame signification. Lord Coke adds, "renunciate, acquietary," and says, that there are other words which will amount to a releafe, as, if the leflee grants to the leflee a right for life, that he shall be discharged of the rent; this is a good releafe. (Litt. § 445. 1 Inft. 264. Plowd. 140.) So a pardone, by act of parliament, of all debts and judgments, amounts to a releafe of the debt; the word pardon including a releafe. (1 Sid. 261.) An express releafe must regularly be in writing and by deed, according to the common rule, "eodem modo oritur, eodem modo difflvitur," so that a duty arising by record must be discharged by matter of as high a nature: fo of a bond or other deed. (Co. Litt. 264. 1 Rol. Rep. 43. 2 Leon. 76. 213. 2 Rol. Abr. 408. 2 Sand. 49. Mor. 573. pl. 787.) But a promiſe by words may, before breach, be discharged or releafed, by word of mouth only. (1 Sid. 177. 2 Sid. 78. Cro. Jac. 453. 620. See Cro. Car. 383. 1 Mod. 262. 2 Mod. 259. 1 Sid. 293.) A releafe of a right in chat- tels cannot be without deed. (1 Leon. 283.) A co-venient perpetual, as that the co-venient will not flee beyond a certain limitation of time, is an absolute releafe. But if the co-venient be, that he will not flee till such a time, this does not amount to a releafe, nor is payable in bar as such, but the party hath remedy only on his co-venient. If two are jointly and severally bound in an obligation, and the oblige, by deed, covenants and agrees not to flee one of them; this is no releafe, and he may notwithstanding flee the other. (Cro. Car. 551. 2 Salk. 575.) But if they are jointly and severally bound, a releafe to one discharges the other. L. Raym. 430.

It seems agreed, that a will, though sealed and delivered, cannot amount to a releafe; and, therefore, where in debt on an obligation, by the reprentative of a teffator, a defendant pleaded, that the teffator by his last will in writing releafed to the defendant; this was adjudged ill; and that no advantage could be taken by plea. (1 Sid. 421.) But it hath been held in equity, that though a will cannot enure 28 a releafe, yet it was provided it were expressly to be the intention of the teffator that the debt should be discharged, the will would operate accordingly: and that, in such case, it would be plainly an absolute discharge of the debt, though the teffator had survied the legatee. (1 P. Wms. 55. 2 Vern. 521.) If a debt is mentioned to be devolved to the debtor, without words of releafe, or discharge of the debt, and the debtor die before the teffator, this will not operate as a releafe, but will be considered as a lapsed legacy, and the debt will subsist. (2 Vern. 522.) A debt is only a right to recover the amount of the debt by way of action; and as an executor cannot maintain an action against himself, or against a co-executor, the teffator, by appointing the debtor an executor of his will, discharges the action, and consequently discharges the debt. Still, however, when the creditor makes the debtor his executor, it is to be con- sidered merely as a specifie bequest or legacy, devided to the debtor to pay the debt; and, therefore, like other legacies, it is not to be paid or retained till the debts are satisfied; and if there be not aflets for the payment of the debts, the execu- tor is answerable for it to the creditors. In this case, it is the same whether the executor accepts or refusing the execu- torship. On the other hand, if the debtor makes the creditor his executor, and the creditor accepts the executorship, if there be aflets, he may retain his debt out of the aflets against the creditors in equal degree with himself; but if there be not aflets, he may sue the heir, when the heir is bound. 1 Inft. 264. 6 in n. See EXECUTOR.

Littleton says, that a releafe of all demands is the best releafe to him, to whom it is made; and Coke says, that the word "demand" is the largest word in law, except "claim;" and that a releafe of all demands discharges all sorts of actions, rights, and titles, conditions before or after, breach, executions, appeals, rents of all kinds, coven- ants, annuities, contracts, recognizances, llates, commons, &c. (Litt. § 508. Co. Litt. 291.) A releafe of all actions discharges a bond to pay money on a future day. But a releafe of actions does not discharge a rent before the day of payment. (Co. Litt. 292.) By a releafe of all manner of actions, all actions, as well criminal as real, personal and mixed, are released. Co. Litt. 287. See Jacob's Law Dict. by Tomlins.

RELEAGATION, RELEGATION, a kind of exile or ban- nishment, by which the obnoxious person is commanded to retire to a certain place prefcribed, and to continue there till he be recalled.

Lord Coke calls relegation a banishment for a time only; Courtin more adequately defines relegation a banishment to a certain place for a certain term.

In Rome, relegation was a less severe punishment than deportation, in that the relegated person did not thereby lose the rights of a Roman citizen, nor those of his family, as the authority of a father over his children, &c.


Gen. Ch. Common calyx oblong, imbricated, with ob- long chaffy scales. Cor. compound, radiated; united florets in the disk numerous, tubular, funnel-shaped, five- cleft; female ones in the radius ligulate, ovate-oblong.
REL

Stam., in the perfect florets, filaments five, very short; another combined into a tube. Pet., in the perfect florets, germin oblong; style simple; stigmas two, reflexed; in the female ones, germin oblong, rather incurved; style simple; stigmas two, recurved. Pet. none, except the permanent unchanging calyx. Seeds, to all the florets alike, solitary, angular, with a membranous, many-cleft, short crown. Receptacle chaffy.


M. l'Heritier distinguishes this genus from *Athanaia* by the preference of a radius; from *Ofmutes* by the florets of that radius producing perfect seeds; and from *Leysiera* by the want of a feathery feed-down. Gartner remarks that his *Eclopes*, adopted from Dr Joseph Banks's and Dr. Sander's papers, is nothing more than an *Athanaia*, furnished with a radius. A doubt as to the fungineous class soon teaches us to mistrust this character, which is unalterable, even in several species of that class; witness the genera *Coreopsis* and *Bidens*. Still less is the fertility or barrenness of the radiant florets capable of distinguishing natural genera, though Linnaeus has, undeniably, founded a distinction of orders, in the class in question, upon those differences. We cannot but believe, therefore, to the opinion of Poiret, that the genus of *Relhania* is not naturally distinct from the Linnaean *Ofmutes*, at least, which last name being already established, ought to have been retained. However linking the radiating, chaffy, lining inner scales of the calyx may be in a few species of *Ofmutes*; approaches towards that character are found in the *Relhania, as genistifolia*, and *Rilla* more in *palaeacea*. We are far from intending to do away the claims of our friend, Mr. Relhian, to botanical reparation, even were that honour bestowed in general far less indiscriminately than it is. For the present, the *Relhania* of L'Heritier is received; and if that be at any time abolished, there ought to be one established on more solid principles.

Willdenow has nineteen species of this suppos'd genus; all natives of the Cape of Good Hope, mostly of a shrubbby bushy habit, green-house plants in England, where only one of them indeed appears to be cultivated. Their flowers are mostly corymbose, small, of a dull yellow, not remarkable for beauty. We select a few examples.

R. *squalrosa*. Hook-leaved Relhania. Wild. n. 1. Ait. n. 1. (Athanaia squalrosa; Linn. Sp. Pl. 1180. Aven. Acad. v. 6. 98. Santolina squalrosa; Linn. Aven. Acad. v. 4. 329.)—Leaves elliptical, pointed; recurved; sent to Kew by Mr. Maffen, in 1794. It flowers in the green-house in May and June. The whole flower is smooth, much branched. Leaves numerous, somewhat imbricated, about a quarter of an inch long, elliptical, obscurely fiddle-ribbed beneath, entire, acute; strongly recurved, smooth, finely dotted on both sides. Flowers solitary, on slender axillary flacks, thrie the length of the leaves. Calyx about half an inch long, very smooth, rather thinning. This should be a different plant from *R. squalrosa* of Thunberg, who defines its "with terminal umbels," and has thus led Willdenow, contrary to the description of Linnaeus, to refer the species to the 1st section of the genus, "with aggregate flowers." It appears, by specimens in the Linnaean herbarium, that the flowers are sometimes so crowded about the ends of the branches, as to assume a corymbose appearance, though each flack is really axillary. Such a specimen probably was described by Thunberg.

R. *genistifolia*. Broom-leaved Relhania. Wild. n. 2. (Athanaia genistifolia; Linn. Syll. Nat. ed. 12. v. 2. 540. Mant. 464.)—Leaves obovoato-lanceolate, pointed, single-ribbed beneath, entire, smooth, somewhat imbricated. Flowers terminal, umbellate. A leafy *forb*, very much branched. Leaves a quarter of an inch, or hardly so much, in length, numerous, crowded, dotted, entire, smooth; the lower ones obovoate, and smaller; the upper more lanceolate and elongated; all bluntish, with a minute, often hooked, point, and single-ribbed at the back only. Flowers smaller than the preceding, from five to eight together, in little terminal umbels. Calyx thining.

R. *vilicifo*. Glutinous Relhania. L'Herit. Sert. 23. Wild. n. 5. (Eclopes vilicifo; Gartn. v. 2. 440. t. 166.)—Leaves linear-lanceolate, pointed, vilicifo, obscurely single-ribbed, rather fiddly; the upper ones somewhat crenate. The flowers are much like the last-mentioned; but the leaves are twice as large, more elongated in shape, more flitily ribbed, the edges of the upper ones rough or crenate, and all of them extremely glutinous. When bruised, the dried leaves are found to retain a powerful aromatic fume, approaching to that of orange-jecl.

R. *pedunculata*. Long-flaked Dwarf Relhania. L'Herit. Sert. Angl. 23. Wild. n. 7. (R. pumila; Thumb. Prod. 146. Athanaia pumila; Linn. Sp. Pl. 562. Zoegna capsena; ibid. 382.)—Leaves linear, villous, and glutinous. Stem diffuse. Flower-flaks axillary, much longer than the leaves. A small herbaceous annual species, whose root is furnished with numerous capillary fibres. Stem a span high, branched from the base, round, purplish, spreading; glandular and freely cottony in the upper part, as well as the leaves; which are about an inch long, very narrow, somewhat triangular. Flowers small, yellow, on long, flutiform, downy, axillary flaks, about the summits of the branches. This occurs twice in the Supplementum, having, in one instance, been defribed by Linnaeus himself, from a wild specimen, and in the other, adopted by his son, uncleen, from Thunberg's communications.

R. *palaeacea*. Chaffy-flowered Relhania. L'Herit. Sert. Angl. 24. Wild. n. 11. Thumb. Prod. 146. (Leysiera palaeaceae; Linn. Syll. Veg. ed. 13. 641. L. ericoides; Berg. Cap. 294. *Eclopes*; Lamarck f. 2. Afromorphus fruicifolus luteus, folia rosiflorum crebris, ovaris hirtulis; Vaill. Ait. German edition, 583.)—Leaves linear, triangular, channelled, hoary; recurved at the point. Flowers terminal, solitary, sefifile. Calyx tubinate. Communicated by Van Royen to Linnaeus, and by Sherard, as it appears, to Vaillant. The stem is shrubbly, a span high, branched. Leaves numerous, about an inch long, narrow, clothed, as well as the young branches, with fine hoary down. Calyx ovate, smooth, a quarter of an inch in diameter; its inner scales much elongated, lanceolate, acute, and membranous, refembling the flaks of the receptacle, which fland prominent and erect, above the florets of the disk. This plant has so much of the external aspect of *Leysiera gnaphalodes*, that we can hardly wonder at Linnaeus, for having referred it by the habit alone, to the same genus. Upon a careful examination, however, the characters, and even the appearance, of the parts of fructification, are abundantly different in the two plants.

Most of the other species of *Relhania*, in Willdenow, are adopted from the short specific definitions of Thunberg and L'Heritier; nor have we been able to determine them all with certainty. It is remarkable that no figure of any has appeared, except in Gartner and Lamark, nor is the latter very happy or discriminative, in what he has exhibited of this genus, called by him, *Relhania, Eclopes.*

RELIQUES, RELIQUE, in the Romish Church, certain
remains of the body or clothes of some saint or martyr, devoutly preserved in honour to his memory, carried at processions, killed, revered, &c.

The abuses of that church in point of relics have been very flagrant. F. Mabillon, a Benedictine, complains of the great number of suspected relics exposed on altars; he owns that there were there to be a strict inquisition into the relics, vast numbers of spurious ones would be found offered everywhere to the piety and devotion of the faithful; and adds, that bones are frequently consecrated, so far from belonging to saints, that, in all probability, they do not belong to Christians.

The catacombs are an inexhaustible fund of relics; yet it is still disputed who were the persons interred in them.

In the eleventh century, a method was introduced of trying suppos'd relics by fire. Those which did not consume in the fire were reputed genuine; the rest not.

It is an ancient custom, which still obtains, to preserve the relics in the altars on which masses are celebrated. To this purpose, a square hole is made in the middle of the altar, big enough to receive the hand; and in that is the relic deposited, being first wrapped in red silk, and inclosed in a leaden box.

The Romanists allege a considerable degree of antiquity in behalf of their relics. The Manichees, it seems, out of hatred to the flesh, which they held an evil principle, are recorded as refusing to honour the relics of saints; which is esteemed a kind of proof, that the Catholics did it in the first ages.

Indeed, folly and superstition blended themselves with religion at too early a period. Even the touching of linen clothes on relics, from an opinion of some extraordinary virtue derived from them, appears to be as ancient as the first ages; there being a hole made in the coffins of the forty martyrs at Constantinople, expressly for this purpose.

This practice of honouring the relics of saints, on which the church of Rome, in succeeding ages, founded her superstitious and lucrative use of them, as objects of devotion, as a kind of charms or amulets, and as instruments of pretended miracles, seems to have originated in a very ancient custom, that prevailed among Christians, of assembling at the cemeteries or burying-places of the martyrs, for the purpose of commemorating them, and of performing divine worship. When the profession of Christianity obtained the protection of the civil government, under Constantine the Great, lately churches were erected over their sepulchres, and their names and memories were treasured with every possible token of affection and respect. (See Saints.) In process of time, this reverence of the martyrs exceeded all reasonable bounds; and those prayers and religious services were thought to have a peculiar sanctity and virtue, which were performed over their tombs. Hence probably proceeded the practice, already mentioned, which obtained in the fourth century, of depositing relics of the saints and martyrs under the altars in all their churches. This practice, however, was then thought of such importance, that St. Ambrose would not consecrate a church, because it had no relics; and the council of Constantinople in Trullo ordained, that those altars should be demolished, under which there were found no relics. The rage of procuring relics for this and other purposes of a similar nature became so excessive, that, in 386, the emperor Theodosius the Great was obliged to pass a law, forbidding the people to dig up the bodies of the martyrs, and to traffic in their relics.

Such was the commencement of that respect for sacred relics, which, in after ages, was perverted into a formal worship of them, and became the occasion of innumerable processions, pilgrimages, and miracles, from which the church of Rome hath derived incredible advantage. Towards the close of the ninth century, it was not enough to reverence departed saints, and to confide in their intercessions and succours: it was not enough to clothe them with an imaginary power of healing diseases, working miracles, and delivering from all sorts of calamities and dangers; their bones, their clothes, the apparel and furniture they had possessed during their lives, the very ground which they had trod, or in which their putrid carcases were laid, were treated with a fuprid veneration, and suppos'd to retain the marvellous virtue of healing all disorders both of body and mind, and of defending such as possessed them against all the assaults and devices of Satan. The confluence of this wretched notion was, that every one was eager to provide himself with these salutary remedies; for which purpose, great numbers undertook fattiguing and perilous voyages, and subjected themselves to all sorts of hardships; while others made use of this delusion, to accumulate their riches, and to impose upon the miserable multitude by the most impious and shocking inventions. As the demand for relics was prodigious and universal, the clergy employed all their dexterity to satisfy these demands, and were far from being nice in the methods they used for that end. The bodies of the saints were fought by fasting and prayer, intituled by the priest, in order to obtain a divine answer and an infallible direction; and this pretended direction never failed to accomplish their desires: the holy carcase was always found, and that always in conformance, as they impiouly gave out, of the fuggelation and inspiration of God himself. Each discovery of this kind was attended with excessive demonstrations of joy, and animated the zeal of these devout seekers to enrich the church full more and more with this new kind of treasure. Many travelled with this view into the Eastern provinces, and frequented the places which Christ and his disciples had honoured with their presence, that, with the bones and other sacred remains of the first heralds of the gospel, they might comfort dejected minds, calm trembling consciences, fave sinking faith, and defend their inhabitants from all sorts of calamities. Nor did these pious travellers return home empty; the craft, dexterity, and knavery of the Greeks found a rich prey in the stupid credulity of the Latin relic-hunters, and made a profitable commerce of this new devotion. The latter paid considerable sums for legs and arms, skulls and jaw-bones, (several of which were Pagan, and some not human,) and other things that were suppos'd to have belonged to the primitive worthies of the Christian church; and thus the Latin churches came to the possession of those celebrated relics of St. Mark, St. James, St. Bartholomew, Cyprian, Pantheon, and others, which they shew at this day with so much ostentation. But there were many, who, unable to procure for themselves these spiritual treasures by voyages and prayers, had recourse to violence and theft: for all sorts of means, and all sorts of attempts, in a cause of this nature were confided, when successful, as pious and acceptable to the Supreme Being.

Besides the arguments from antiquity to which the Papists refer, in vindication of their worship of relics, of which the reader may form some judgment from this article, Bellarmine appeals to scripture in support of it, and cites the following passages, viz. Exod. xiii. 19. Dnt. xxxiv. 6. 2 Kings, xiii. 21. 2 Kings, xxii. 16, 17, 18. Isaiah, vii. 10. Matth. xi. 20, 21, 22. Acts, v. 12—15. Acts, ix. 11, 12. See Pope's.
Relics are forbidden to be used or brought into England by several statutes; and justices of peace are empowered to search houses for Popish books and relics, which, when found, are to be defaced and burnt, &c. 3 Jac. I. cap. 26.

RELICT, Relieca, in Law. See Widow.

RELICTA. Verification, is when a defendant relinquishes his proof or plea, and thereupon judgment is entered for the plaintiff.

RELIEF, Relieum, Levanem, a fine paid the chief lord, by a person at his coming to the inheritance of land held by military service.

This was said to be hereditatem caduca; and the money thus paid was called redemtum, releifum, or relief. Relief is usually to the value of a year's rent or revenue.

The origin of the custom is thus: a feudal or beneficiary estate in lands being at first only granted for life, after the death of the vassal, it returned to the chief lord, and was hence called feudum caduca, q. d. fallen to the lord by the death of the tenant.

In course of time, these feudal estates being converted into inheritances by the connivance and consent of the lord; when the possessor of such estate died, it was called hereditas caduca, q. d. an inheritance fallen to the lord, from whom it was to be recovered, by the heir's paying a certain sum of money. But this sum was arbitrary, and at the will of the lord; so that, if he pleased to demand an exorbitant relief, it was in effect to disinherit the heir.

The English ill brooked this consequence of their newly-adopted policy; and, therefore, William the Conqueror by his laws (cap. 22, 23, 24.) ascertained the relief, by directing (in imitation of the Danish heriots), that a certain quantity of arms and habiliments of war should be paid by the earls, barons, and vassavours respectively; and if the latter had no arms, they should pay 100. William Rufus broke through this composition, and again demanded arbitrary uncertain reliefs, as due by the feudal laws; thereby in effect obliging every heir to new-purchase or redeem his land; but his brother Henry I. by his charter, restored his father's law; and ordained that the relief to be paid should be according to the law so established, and not an arbitrary redemption. But afterwards, when, by an ordinance in 27 Hen. III. called the Affize of Arms, it was provided that every man's armour should defend to his heir, for defence of the realm, and it thereby became impracticable to pay the acknowledgments in arms, according to the laws of the Conqueror, the composition was universally accepted of 100. for every knight's fee; as we find it ever after established. (Glanv. l. ix. c. 4. Litt. § 112.) But it must be remembered, that this relief was only then payable, if the heir at the death of his ancestor had attained his full age of twenty-one years.

RELIEF, Reasonable, called also lawful and ancient relief, is that enjoined by some law, or fixed by ancient custom; and which does not depend on the will of the lord.

Thus in a charter of king John, mentioned by Matthew Paris:—\textit{Si quis comitum vel baronum noltrorum, five aliorum tenementum de nobis in capite per servitium militare, mortuus fuerit, & cum dececerit, hares fuus plene atatis fuerit, & relevatus debet, habet hereditatem fuam per antiquam relevum.}

\textit{What this was, may be seen in the laws of William the Conqueror, &c. Bracton says this fine was called a relief, \textit{quia haereditas, quae jacens fuit per antecessorius decessum, relevatur in manus heredum, &c.}}

A relief is also paid in focage-tenure, or petit ferjeancy; where a rent, or other thing, is paid by rendering as much as the rent or payment reserved. But the manner of taking relief upon focage-tenure is very different from that upon tenure in chivalry. The relief on a knight's fee was 5s., or one-quarter of the fupposed value of the land; but a focage-relief is one year's rent or render, payable by the tenant to the lord, be the same either great or small (Litt. § 125,); and, therefore, Bracton (1. 2. c. 37. § 8.) will not allow this to be so properly a relief, but \textit{cuius quidem loci relevii in recognitionem dominii.} So, too, the statute 28 Edw. I. c. 1. declares, that a free lokuham shall give no relief, but shall double his rent after the death of his ancestor, according to that which he hath used to pay his lord, and shall not be grievous above measure. Reliefs in knight-service were only payable, if the heir at the death of his ancestor was of full age; but in focage they were due even though the heir was under age, because the lord has no wardship over him. (Litt. § 127.) The statute 12 Car. II. reserves the reliefs incident to focage-tenures; and, therefore, whenever lands in fee-simple are held only by a rent, relief is still due of common right upon the death of a tenant. 3 Lev. 145.

By the custom of Normandy, relief is due for lands held in villainage as well as in fee. By the custom of Paris, relief is not due upon inheritances in the direct line.

The quantity of the relief is very different; there are single reliefs, double reliefs, &c. The quality, too, is diverse: there are reliefs of property, paid by the heir; reliefs of bail, or to watch, paid by the guardian for his minor, or by the husband for the fiefs of his wife, &c.; relief of horses and arms, &c.

By the laws of king Canutus, the relief of an earl, paid to the king, was eight war horses with their bridles and saddles, four cuirasses, four helmets, four swords, four hunting-horses, and a palfrey. The relief of a baron or thane was four horses, &c.

RELIEF, in Chancery, denotes an order sued out for the dissolving of contracts, and other acts, on account of their being unreasonable, prejudicial, grievous, or from other nullity, either \textit{de jure, or de facto.}

Minors obtain relief against acts passed in their minority. Majors have relief in cases of enormous damage, deceit, violence, over-reaching, extravagant bargains, &c.

Among the Romanists it is a rule, that a thing obtains relief any time, and against all acts passed in its prejudice; no prescription prevailing against it.

RELIEF, Aid de. See Aid.

RELIEF of a Hare, among Hunters, is the place where the goes to feed in the evening.

RELIEF, in Sculpture. See RELIEVO.

RELIEVE, in the Military Sense. To relieve, is to take the post of another-body. Hence, to relieve the guard, to relieve the trenches, &c. is to bring fresh men upon the guard, or to the trenches, and to fend those to rest who have been upon duty before. They also fay, relieve a sentinell, which is generally done every two hours, by a corporal who attends the relief; relieve the heretworn, &c.

To relieve a place that is besieged, is to furnish it with a supply of men, provicions, ammunition, &c.

RELIEVER, in Artillery, is an iron ring fixed to a handle by means of a socket, so as to be at right angles to it. It serves to difengage the firit fearcher of a gun, when any of its points are retained in a hole, and cannot be got out otherwise.

RELIEVING TACKLES, in a Ship, are two strong tackles, used to prevent a ship from overturning on the case, and to affit in bringing her upright after that operation is completed. The relieving tackles are furnished 4 N. with
RELIEF, or Relief, is applied to a figure which projects, or stands out prominent, from the ground or plane on which it is formed, whether that figure be cut with the chisel, moulded, or cast. There are three kinds of relief: viz., alto, bass, and demi-relief.

RELIEF, Alto, haut relief, or high relief, is when the figure is formed after nature, and projects as much as the life.

RELIEF, Bass, bas relief, or low relief, is when the work is but raised a little from its ground, as we see in medals, and in the frontispieces or buildings, particularly the histories, feticoes, foliages, and other ornaments in friezes. See BASO RELIEF.

RELIEF, Demi-relief, is when one-half of the figure rises from the plane, i.e., when the body of a figure seems cut in two, and one-half is slanted on a ground. When in a basso relievo there are some parts that stand clear out, detached from the rest, the work is called a demi-tasse.

RELIEF, in Architecture, denotes the fally or projection of any ornament.

This, Daviler observes, is always to be proportioned to the magnitude of the building it adorns, and the distance at which it is to be viewed.

If the work be inflated, and terminated on all sides, it is called a figure in relievo, or a round emblazon. Such are statues, acroters, &c.

RELIEF, in Painting, denotes the degree of force or boldness by which a figure seems, at a due distance, to stand out from the ground of the painting, as if really imbedded.

The relievo depends much on the depth of the shadow, and the strength of the light; or on the light of the different colours bordering on one another; and particularly on the difference of the colour of the figure from that of the ground.

When the light is well chosen, to make the nearest parts of figures advance; and well diffused on the majestic, still diminishing intensely, and terminating in a large specious shadow, brought off intensely; the relievo is said to be bold, and the claire obscure, well underlaid.

RELIGION, Religion, that worship or homage that is due to God, considered as Creator, Preserver, and, with Christians, as Redeemer of the world.

The foundation of all religion is, that there is a God; and that he requires some acknowledgment and service from his creatures.

Accordingly, religion, in the true meaning of the term, necessarily supposes and includes an intercourse between God and man; i.e., on the part of God discoveries and manifestations of himself and his perfections, and of his will with regard to the duties which he requires: and on the part of man, a capacity and readiness to receive and improve those discoveries, and to conform to all the significations of the divine will. For it is an undeniable principle, that whatsoever plainly appears to be the mind and will of God, whatever be the way in which we obtain the knowledge of it, we are indifferently obliged to observe. And as there are two ways by which God may be supposed to manifest himself and his will to mankind, viz., by his works and by his word, religion has been usually distributed into natural and revealed. Those are not two kinds of religion, essentially different, much less contrary or contradictory to each other, because they both have God for their object, and proceed from him; nor are they altogether the same, and differing merely in the mode of their communication. Although all true revealed religion must be consistent with, and in no respect contrary to, the clear light of nature and reason, yet it may discover and reveal several things pertaining to truth and duty, which that light, if left to itself, could not have discovered at all, or not with sufficient clearness and certainty. These should not be opposed to one another; nor is the one of them designed to exclude the other.

RELIGION, Natural, has been taken in different acceptations. Some understand by it every thing in religion, with regard to truth and duty, which, when once discovered, may be clearly shewn to have a real foundation in the nature and relations of things, and which, if unprejudiced reason will approve, when fairly propounded, and let in a proper light. Accordingly some Christian philosophers and divines have comprehended under their scheme or system of natural religion, a considerable part of what is contained in the scripture revelation, i.e., the important truths and principles relating to the existence, the unity, and attributes of God, his governing providence and moral administration, the worship that is due to him, the law that is given to mankind; or the whole of moral duty in its full extent, as relating to God, our neighbours, and ourselves, the rewards and punishments of another state; and other articles nearly connected with these, and dependent upon them. Having taken great pains to shew, that all this is perfectly agreeable to reason, and founded in the nature of things, they have honoured the whole with the name of natural religion. None can hesitate to allow, that it is a real and great service to religion to shew, that the main principles and duties of it are what reason must approve; and those are unquestionably entitled to praise, who have undertaken to demonstrate this with great clearness and force of argument. But it does not follow that, because these things, when once clearly discovered, may be proved agreeable to reason, and to have a real foundation in the nature of things, reason alone, in the present state of mankind, if left to itself, without higher assistance, would merely, by its own force, have discovered all of them, with their genuine concomitants, and have applied them to their proper uses, for directing men in the true knowledge and practice of religion. Many things, says Mr. Locke, in his "Reflections of Christianity," are taken for unquestionable truths, and easily demonstrable, without considering how long we might have been in doubt or ignorance respecting them, if revelation had been silent. Native and original truth is not so easily wrought out of the mind, as we who have it ready dug and fashioned to our hands, are apt to imagine. To the same purpose Dr. Clarke observes, (Diss. on Nat. and Rel. Religion,) that it is one thing to see, that these rules of life, which are before-hand plain and particularly laid before us, are perfectly agreeable to reason, and another thing to find out these rules merely by the light of reason, without their having been first otherwise made known. Accordingly some able and ingenious defenders of natural religion, or the law of nature, though they contend that it is founded in the nature of things,
things, and agreeable to right reason, derive the promulga-
tion of it from divine revelation. Hence it may be con-
cluded, that natural religion, or the Law of Nature (which
fee), is not so called, because it was originally discovered
by natural reason, but because, when once made known, it
is what the reason of mankind, duly exercised, approves, as
founded in truth and nature.

Natural religion, in the sense now explained, is very con-
fident with the supposition of an extraordinary divine reve-
lution, for the purpose of discovering and promulgating it
at first, and also of re-establishing and confirming it, when,
through the corruption of mankind, the important prin-
ciples and duties of it were sunk into such darkens, and so
confounded with pernicious erors, that an extraordinary
affiurance was necessary to recover men to the right know-
ledge and practice of it.

Natural religion is understood by others in a sense which
is absolutely exclusive of all extraordinary revelation, and
in direct opposition to it. By natural religion, they mean
that religion which men discover by the sole exercise of
their natural faculties and powers, without any other or higher
affurance. These persons discard all pretences to extraordi-
nary revelation, as the effects of enthusiasm or imposture.
It is in this sense, that those who call themselves Deists (see
that article) understand natural religion, which they highly
exalt as the only true religion, the only discovery of truth
and duty upon which we may safely depend; and which
comprehends the whole of what is necessary to be known
and done, in order to our obtaining the favour of God, and
attaining to true happiness. But those who take natural
religion in this sense entertain different opinions of the sub-
ject, and express their sentiments variously. The aforesaid
advocates for natural religion, as opposed to revelation, main-
tain, that it is clear and obvious to the whole human race,
and that all men have a natural knowledge of it. They
argue, that since religion is equally the concern of all man-
kind, the wisdom and goodness of God require, that it
should be actually known to all. To this purpose is the
reasoning of Lord Herbert, who alleges, that God hath
imprinted on the minds of all men innate ideas of the main
principles of religion and morality. Tindal also, and the
author of "Christianity as old as the Creation," argue in a
similar manner: the former affirms, that this clear univer-
sal light that shines into the minds of all men cannot be made
clear to any man by an external extraordinary revelation; with
the latter it is a kind of fundamental principle, that the law,
or religion, of nature was a perfect scheme of religion and
morality, fairly drawn on the mind and heart of every man,
in such a manner, that it is not possible for any man to mis-
take it; and he even affirms, that the most illiterate of
the human race have naturally and necessarily a clear and intimate
perception of the whole of religion and of their duty.

Hence it will be easily owned, that there is no need of an
extraordinary revelation to teach men what they all natu-
rally and necessarily know. This scheme, however plausible
it may at first appear, and though it seems to exhibit a
beautiful representation of the dignity of our species, and of
the universal goodnrefs of God to the human race, appears
tobe altogether visionary, when brought to the test of fact
and experience: whilst it supposes, that religion, in its true
nature and just extent, is naturally known to all men, so
that they cannot mistake it, it contradicts the testimony of
the authentic history of mankind in all ages, which evinces
that they have misfaken religion in its important prin-
ciples and obligations.

Sensible of the inconveniences of this scheme, others, by
natural religion, understand not merely that which is na-
turally and necessarily known to all men, but that which
reason, duly exercised and improved, is able, by its own
natural force, to discovery, without the affurance of any ex-
traordinary revelation. In order to form a just conception
of this theory, we might investigate the extent of the
powers and abilities of human reason in judging concerning
matters of religion, independently of all revelation; but
without entering on a speculation of this kind, the discu-
SSION which would be more curious in the process than
satisfactory in the result, we should recur to the certain
and plainest mode of judging, which is the examination of the
conclusions that may be deduced from fact and experience.
Let us then inquire, what hath human reason actually done
in this way, by its own force, without any extraordinary
affurance? The satisfactory answer to this inquiry cannot
be obtained from any systems formed by persons who have
lived in ages and countries which have enjoyed the light of
divine revelation; since in this case it may reasonably be
supposed, that they have borrowed light from revelation,
though they are not willing to acknowledge it, or may not
themselves be sensible of it. Systems, therefore, that have
been drawn up by our modern admirers of natural religion
in Christian countries, cannot be alleged in proof of the
force of unassisted reason in matters of religion; and the
same may be said of those Pagan philosophers who have lived
after Christianity had made some progress in the world.
Nor can we fairly infer the sufficiency of the light of natu-
ral reason, without the aid of revelation, from the systems
of the ancient philosophers, lawgivers, and moralists, who
lived before the Christian revelation was published; unless
it can be shown, that they themselves derived the religious
and moral principles which they taught, solely and entirely
from the researches and disquisitions of their own reason,
and disclaimed their having had any affurance, with regard
to those truths and princliples, from tradition or divine in-
struction. And it is no hard matter to shew, by testimonies
from the most celebrated ancients, that this was not the case,
nor was it what they ascribed to themselves. It is well
known, that the most admired philosophers of Greece did
not pretend to set up merely on their own flocks, but tra-
velled into Egypt, and different parts of the East, for the
purpose of improving their knowledge by conversation with
the fages of those countries; who themselves professed to
have derived their knowledge, not merely from the disqui-
sions of their own reason, but from higher sources, from
very ancient traditions, to which, for the most part, they
affigned a divine original. After all it must be allowed,
that the most celebrated and sagacious of the ancient philo-
osophers made pathetical complaints of human darkness and
ignorance, and of the great difficulties they experienced in
searching after truth. Many of them were sensible of the
great need there was of divine instruction and affurance, for
enlightening and directing mankind in matters of religion
and their duty: so that no argument can be justly drawn
from the wise men and philosophers among the ancients, to
shew that the knowledge of what is usually called natural
religion, in its just extent, is wholly and originally owing to
the force of human reason, exclusive of all divine revela-
tion.

And perhaps, says the excellent writer whose observations
we are now citing, it would not be easy to mention any
notions, among whom any true knowledge of religion has
been preferred, concerning which we can be assured, that
they never had any benefit from the light of divine reve-
lation; and that the principles of religious truth and duty,
which were to be found among them, were originally the
more produced of natural reason, without any higher affi-
urance. Several things may be observed among them, which

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seem to be the remains of an ancient universal tradition, or primeval religion, derived from the remotest antiquity, and which, probably, had their original source in divine revelation, though in process of time it was greatly altered and corrupted. Leland's Advantages and Necessity of the Christian Revelation, vol. i. § 1.

Religion, Revealed, is commonly understood to be that knowledge of religion, which was originally communicated from God to men in a way of extraordinary revelation, for instructing them in important religious truths, and directing and engaging them to the practice of their duty. In a general sense, all truth, and the manifestation of it, may be said to come from God, even that which we discover in the ordinary use of those rational faculties which God hath given us. But revealed religion, as distinguished from that which is usually called natural, denotes that knowledge of religion which was originally communicated in an extraordinary and supernatural way. Leland, ibid supr. See Revelation.

The first kind of religion, above-mentioned, or natural religion, flows immediately from the relation between the creature and the Creator; the latter, or revealed religion, does not flow from such a relation, but is superadded from the mere will and pleasure of the Creator.

The first we ordinarily call morality, or ethics; because immediately connected with the manners and duties of men towards one another; and towards themselves, considered as creatures of that Being. See Ethics, Morality, and Moral Philosophy.

The latter we call, by way of eminence, religion, as being the rule of our duty immediately to God himself.

The first supposes a God, a providence, and a future state, of rewards and punishments; the latter likewise supposes an immediate mission from God Himself, attested by miracles, &c. See Christian Religion.

Religion is more particularly used for that special fyttem of faith and worship, which obtains in a particular age, sect, or country, &c.

In this sense we say the Romish religion, the Reformed religion, the religion of the Greeks, the Mahometan religion, the Jewish religion, &c. See Judaism, Mahometanism, &c.

The Siamese hold the diversity of religions, i.e. the different manners of honouring God, to be pleasing to him; inasmuch as they have all the same object, and all tend to the same end, though by different means. Claude.

This sentiment of these idolaters is doubtless more just than that of our zealots, who hold all but those of their own religion odious to God. The several sects in religion are under their proper articles. See also Sect.

Of the religion of the ruling part of the world, you may find a lively description in a chapter in Seneca's Troas, at the end of the second act, beginning thus: "Venera et, annos fabula decipi? umbra corporis vivere conditi, &c." This, according to Patin, is the religion of princes, and great men, of magistrates, monarchical superiors, and even some physicians and philosophers. M. Du Maine, head of the leaguers in France, used to say, that princes have no religion till after they are turned of forty. "Cun numine nobis mors inflat, major facit." Patin. Lett. Choix. 106.

Under this article we are naturally led to discuss the subject of national religion, in its connection with religious establishments. It must appear, on the slightest reflection, that religion has a very considerate influence, not only on the disposition and character of individuals, but on the state of society in general. Accordingly legislators and rulers have often found it one of the most powerful instruments of civil policy; and the history of almost every country affords numerous instances of its being an excellent ally to the power of the civil magistrate, or the most dangerous rival. By religion we mean now that principle which influences men by the dread of evil or the hope of reward, from unknown and invisible causes; whether the good or evil be expected to take place in this world or in another; and in this general sense of the term, it comprehends enthusiasm, superstitio, and every other species of false religion as well as the true. It would lead us too far, if we attempted to trace the influence of this principle in the more barbarous or more civilized nations of antiquity. Enthusiasm and superstition have been more powerful and more efficacious on many occasions, which history records, than political wisdom in the cabinet, or martial skill and valor in the field. In some cases religion has concurred with the views of the civil magistrate; and in others, it has counteracted them even in favour of the best interests of mankind. It is an observation of Mr. Hume's, that the precious sparks of liberty were kindled and preserved by the Puritans in England, and that it is to this fact, whole principles appear so frivolous, and whose habits so ridiculous, as he somewhat invidiously describes them, that the English owe the whole freedom of their constitution. The allusion, however, is too general. The capital advantage derived from Christianity in this western part of the world, is the total abolition of slavery, in consequence of its raising men's ideas of the importance of the human species. It is a memorable fact, that after the introduction of Christianity into the Roman empire, every law which was made relating to slaves was in their favour, till at last all the subjects of the empire were reckoned equally free. Although, in later times, slavery has been revived and continued, for commercial purposes, in countries calling themselves Christian, we trust that laudable efforts, originating in the liberal sentiments and affections which Christianity inculcates, will be crowned with success, and gradually amani thes of this nefarious kind of traffic in every nation of the globe. Christianity, indeed, is almost incompatible with absolute despotic power, both in sover reigns and private persons. The corruptions of Christianity, exemplified in the exorbitant power of the pope, and the superstition of the Popish worship, have been indirectly productive of considerate benefit. The union of the western churches under one supreme pontiff facilitated the intercourse of nations in barbarous ages; and the power of the Popish power contributed in no small degree towards preventing the finer arts from being totally lost in the barbarism of Europe, and to their subsequent revival, previously to that of literature and science in this western part of the world. Erroneous notions of religion, and the superstition blended with its purer principles, have been, however, the occasion of the most lamentable evils in the government of states. Beccaria says, in his "Essay on Crimes and Punishments," that more than 100,000 witches have been condemned to die by Christian tribunals. False principles of religion have encouraged men to commit the most horrid crimes; and to inflict tortures both on themselves and others, which cannot be thought of without horror. The historical page of perfecution is stained with blood. But it is our present design to sketch out the benefits resulting from religion to civil society, rather than the evils which the perversion of its principles and genuine spirit have produced. It is natural to imagine, that the civil magistrate would take religion under his protection with a view to these benefits; nevertheless, it is much to be lamented that by erroneous notions of its nature and design, and a misapplication of its influence, it has been rendered the instrument
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instrument of tyranny and oppression. If magistrates and rulers availed themselves of the affittance which religion affords for meliorating the character and condition of the members of the community over which they preside; if they patronized and encouraged the principles and profession of it for the purpose of restraining the profligate and vicious, and of promoting a virtuous conduct with a view to the welfare and prosperity of the state; and if they made use of the mighty powers which religion furnishes them merely for the purpose of maintaining order and peace in the community to which they belong, and of securing and advancing its true interests; there could be no reason for alarm or complaint. Religion and civil government might unite their efforts for such laudable purposes, and co-operate in promoting them, without any apprehension of danger; but lamentable experience has testified that in too many instances religion has been made subservient to ambition and worldly policy, insomuch that many persons of just reflection and comprehensive views have dreaded the interference of civil governors in matters of religion. If, in some cases, they have done good, in others their interference has been pernicious, not only to religion, which has been thus corrupted and degraded, but to the civil community itself. Nevertheless the opinion, that it is necessary for the state to prescribe the principles, and to regulate the modes of religion, has been almost universally prevalent.

We are thus led briefly to discuss the subject of national establishments of religion; and that we may do this without prejudice and partiality, we shall state the arguments on both sides of the question, as much as possible in the language of those who oppose, and of those who defend them. Amongst those who have thought freely, and who have written as freely on this subject, we find some who contend against establishments in any degree whatever. They will not allow that religion should receive any support from the state, but insist that it ought to be left entirely to its own operation. There is, naturally, they say, no more connection between civil government and religion, than between the former and any thing else that depends upon opinion; less than the business of philosophy or religion. Because they respect the present life, with which civil governors have to do; whereas religion respects the life to come, with which they have nothing to do. However, the conclusiveness of this kind of reasoning seems to be materially affected by our preliminary remarks. Religion, it is said, is a concern that lies out of the proper province of the civil magistrate. Its object is inviolable; its principles and affections, which are the springs of moral and religious conduct, as well as its motives and functions, are not subject to the direction and control of secular counsel and power; its seat is the understanding and heart; nor is the external conduct, to which alone the recognition of the civil magistrate extends, of any importance in a moral view, independently of the internal principles in which it originates, and by which it is guided and governed. Besides, it has been urged that civil rulers have no right to prescribe to the judgment in the province of religion, or to frame and enforce rules of moral conduct, for the observance or violation of which mankind are accountable only to God; nor are they competent or qualified for the exercise of such high powers. And if they cannot control the faculties of the mind, their influence on the profession and practice, and that outward conformity to modes and rites of a religious nature which they may enforce, without the consent of the judgment and concurrence of the will, are calculated to do much greater harm than good; and to add to the number of hypocrites or martyrs. As the civil magistrate cannot bestow the rewards, nor inflict the punishments, that are appropriate to religion; and as he cannot estimate the moral worth or demerit of his subjects, he cannot, without culpable presumption, aiphone, nor without intruding on the province of the supreme and almighty God, exercise the authority of a spiritual and final judge. Civil governors in general, such are their rank and station, the course of their education, and the habits of their lives, are less able than many others of lower condition, but of different views and connections, to decide concerning religious truth, or to determine who are qualified to advise and afflict them. Moreover, it has been observed, that neither magistrates nor their ecclesiastical advisers are warranted to establish a standard either of religious faith or moral conduct, to which all the members of a community are required to conform, and from which they are not allowed to deviate without incurring some loss or damage. Such a standard, let it be ever so liberally framed, or ever so mildly enforced, is not likely to be so comprehensive, as to include all the teachers and all the professors of religion, who are entitled to the protection of the state in which their lot is call. Besides, if such a standard of faith and practice could be devised, those who object to religious establishments on the ground now stated, conceive, that their civil rulers have no right to establish and impose it; and that to deprive persons, who cannot approve it, of worldly honours and benefits, to which they have naturally an equal claim with others of their fellow-subjects;—a claim, which they do not forfeit by the exercise of their own judgment in the province of religion. It has also been argued, that Christianity, so far from countenancing, rather discourages every kind of religious establishment, that interferes with the right of private judgment. The language of the divine Author of our holy religion is, "Render to Cæsar the things that are Cæsar's, and to God the things that are God's;" Search the scriptures;—Call no man master on earth;—My kingdom is not of this world." And that of his apostles, "Let every man be fully persuaded in his own mind;—Judge ye what I say;" &c. &c. The adversaries of establishments allege, that a national church, constituted by the civil magistrate, and governed by laws enacted by his authority, and the Christian church, founded on the doctrine of Christ and his apostles, are essentially different; and they say, that such a church, e.g. the church of England, less exceptional than many others, which claims and exercises, according to its 20th article, "power to decree rights and ceremonies, and authority in matters of faith," has, agreeably to the true nature and constitution of the Christian church, no such power and authority; that it is inconformable with the allegiance which Christians, as the subjects of Jesus Christ, owe to him, the only lawgiver and king in the church; who, as they say, hath expressly commanded that no power of this kind shall ever be claimed, or ever be yielded by any of his followers. In the profession of this mode of reasoning, they farther add, that if the church of England hath really this authority and right, the church of Rome had it before, and, as the elder and mother-church, ought to have been obeyed; and consequently the reformation, as it has been called, was a rebellion against superiors, a disobedience to the authority vested in the church, and ought, as such, to be denounced by returning to the church of Rome. They also argue, that this power to order the manner of God's worship, and to settle articles of faith, is not at all lodged in the bishops or clergy, who are the spiritual pastors and guides in the established church, but entirely in the king and parliament of those realms. So far were the bishops and clergy from having any concern in the first forming our present established church,
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or in ordering its rites and articles of faith, that it was done not only without, but in actual opposition to them. Hence they conclude, that the church of England is, in reality, a parliamentary church; that it is not, properly, an ally, as some have asserted, but a mere creature of the State. It depends entirely upon the acts and authority of parliament for its very existence and frame. The qualifications of its ministers, their power to officiate, the manner in which they are to administer the sacraments, are all limited and prescribed by authority of parliament; and this authority, which at first made, can alone alter and new-make it; can abolish, or add to its articles or rites, according to its pleasure, even though the whole body of bishops and clergy ever so much dislike or protest energetically against it.

If it be asked, how came the civil magistrate to possess the authority which he exercises in the church of Christ? The objectors to establishments reply, that the subjection to higher powers, and obedience to magistrates, which the scriptures enjoin on Christians, relates only to civil, and not at all to religious matters, for this obvious reason, that the magistrate was at that time every where Pagans. They say, that Christianity is so far from enjoining, that it actually forbids, obedience to civil governors in things of a religious nature. It commands us "to call no man upon earth father or master" (Matt. xxiii. 8, 9.), i.e. to acknowledge no authority or jurisdiction of any in matters of religion, but to remember, that "one, one only is our Master" and lawgiver, even Christ, and that all Christians are brethren: and that, though the princes of the Gentiles exercise dominion over them, and they who are great exercise authority upon them, yet it shall not," says our Lord, "be so amongst you." (Matt. xx. 25.) Christ's kingdom is not of this world, and of course he is the sole lawgiver, judge, and sovereign in religious matters. (See Matt. xxii. 8, 18, 19. 1 Cor. viii. 6. Ephes. i. 22.) In the church of Christ, it is said, all authority and jurisdiction are vested originally in him, and flow from him, nor can any one lawfully exercise them without a commissio from him; but in the church of England, the king, or queen, is "supreme head," performing "all power to exercise all manner of ecclesiastical jurisdiction, and archbishops, bishops, archdeacons, and other ecclesiastical persons, have no manner of jurisdiction ecclesiastical, but by and under the king's majesty, who hath full power and authority to hear and determine all manner of causes ecclesiastical; and to reform and correct all vice, sin, errors, heresies, enormities, abuseth ever\n\n\n\nby any manner of spiritual authority or jurisdiction, ought, or may be lawfully reformed." (26 Hen. VIII. cap. i. 37 Hen. VIII. cap. 17. 1 Eliz. cap. i.) At the first establishment of this church under Henry VIII. and Edward VI. all the bishops took out commissions from the crown, for the exercising of their spiritual jurisdiction in these kingdoms, during the king's pleasure only; "and in their commissions acknowledge all sorts of jurisdiction, as well ecclesiastical as civil, to have flowed originally from the regal power, as from a supreme head, and a fountain and spring of all magistracy within his own kingdom." Burnet's Hist. Reform. part ii. Col. p. 92.

Yea, even the power of ordination itself, which is reckoned a peculiar of the episcopal office, the first reformers and founders of this church derived from the king, and exercised only as by authority from him, and during his pleasure. Thus Crumier, archbishop of Canterbury, Bonner, bishop of London, &c. took out commissions from the crown, importing, that because the viceroy (Cromwell, a lay person) could not personally attend the charge in all parts of the kingdom, the king authorizes the bishop, in his, (the king's or perhaps the viceroy's) stead to ordain, within his diocese, such as he judged worthy of holy orders; to collate to benefices; to give institution; and to execute all other parts of the episcopal authority; and this during the king's pleasure only."

In conformance of this supremacy, the king or queen of this church hath power to excommuniate from, or to readmit into it, independent of, yea, in direct opposition to, all its bishops and clergy. The king or queen revoke, if they please, any spiritual censures of the bishops or archbishops; yea, can suspend, deprive, or even excommunicate, themselves; or can, by their proclamation only, without the least confederation, humiliation, or satisfaction for their offence, pardon and restore excommunicated persons, the vilest offenders, to the church's bosom again.

Yea, further, they have power to forbid all preaching for a time; as did king Henry VIII. king Edward VI. queen Mary, and queen Elizabeth; to limit, instruct, and prescribe to the clergy what they shall, and what they shall not preach; as did queen Elizabeth, king James I. king Charles I. king William, &c. Finally, to the king or queen only does it pertain to declare what is heresy, and authoritatively to pronounce what doctrines and tenets are, and what are not, to be condemned as such; nor have all the bishops and clergy, assembled in convocation, the least authority to confine any tenet as heretical, if the prince on the throne refuse his consent.

Accordingly, the objectors to religious establishments allege, that in Christ's church, himself is the only sovereign and head; he only hath power to decree ceremonies and rites, to fix terms of communion and authority in points of faith; nor hath any earthly prince power to make laws in his kingdom, which shall bind the conscience of his subjects; or to Sovereignly to dictate to his servants and ministers what they shall believe, and what they shall preach. Yea, his subjects are expressly commanded and charged to receive nothing as doctrine or parts of religion, which are only commandments of men.

But in the church of England there is another sovereign, lawgiver, supreme head, besides Jesus Christ; an authority which commands things which Christ never commanded, which teaches doctrines he never taught, which enjoins terms of communion, and rites of religious worship, which Christ never enjoined. Hence they conclude, that these two churches are two distinct and quite different societies, framed after different models, consisting of different members, and governed by different officers, statutes, and laws. Whilts the objectors to established forms of worship effecem and reverence the great number of illustrious and excellent persons, both clergy and laity, of which the church of England can boast, they suggest, that the present established forms were drawn up when this kingdom first emerged out of Popish darkness; that in drawing them up special regard was had to the weaknesses of the people at that time, who could not be all at once entirely brought off from the old ceremonies and forms; and that there are several parts of our liturgy and ecclesiastical constitution, which even many of our bishops and clergy with to see altered. Schemes have been propoed, and attempts have been made for omitting what is offensive, for correcting what is easily capable of amendment, and for accommodating the doctrine and forms of the established church, to the present advanced state of knowledge, and to the corresponding liberality of the modern professors of religion, both in and out of the church; but they have hitherto been unavailing: and it has been thought, that an exclusive establishment, appropriating to itself distinguished honours and benefits of a peculiar nature, and exposing those who...
whom it does not comprehend to privations, both of emolument and honour, has a tendency to discourage every effort for improving its constitution, and enlarging its boundaries. Some have also been of opinion that it restrains freedom of inquiry, embarrasses integrity, and too much disposes the uninstructed and uninitiated to tolerance and perfecution. From whom, it has been said, is a reform to be expected, but from those who have reason for wishing every thing to continue in statu quo? The dignitaries of the church, whose emoluments induce them to rest satisfied, and the ruling magistrates of the state, who wish things to remain quiet, and the great body of the laity, connected in one way or other with ecclesiastical establishments, cannot be supposed to be very anxious about a change in the constitution of the church: nor will they be at a loss for plausible reasons for refilling any material alteration. The church and the state are so incorporated, that nothing but a revolution, as it has been said, in the latter, would cause any very important amendment in the former. Nevertheless, reformers have maintained, that if the liturgy, clergy, articles, canons, with all the ceremonies and rites of the established church, were entirely vanished from the land; if its immense revenues were applied to ease our heavy taxes, and for the payment of the public debts; if preachers were paid only by voluntary contributions; if the state would not sustain fo essential a loss and damage, that it could not then proceed with safety. Would, they say, the British monarchy be overthrown; our courts of judicature be shut up; the courts of law be deserted; parliaments no more meet; commerce and trade flagitate, because the national church was changed? On the contrary, however great the convulsion might be, the government, both civil and military, might remain the same. A timely reformation, however, would, as they imagine, prevent its total destruction, and contribute to its permanence and prosperity.

Some notice should here be taken of the learned Warburton's famous argument in favour of an established church. The church, says this prelate, has, by contract or alliance, resigned her supremacy in matters ecclesiastical, and her independence, to the state. In consequence of this, the state hath drawn up for her articles of faith, and forms of public worship, which it requires the church to subscribe to. This alliance is a mere phantom, created by the warm imagination of the paradoxical bishop, whose ingenuity and learning have not been sufficient to render it popular, even among the most zealous advocates of religious establishments. Neither our history nor our laws know any thing at all of it. The nature of our constitution utterly disposes it; and arrows the church to be not an ally, but a subject to the state. An alliance supposes independency in the powers between which it subsists. But it is needless to enlarge on this topic.

Whilst it is allowed that religion has an influence on the conduct of men in this life, it is pleaded, on the other hand, that this beneficial influence of religion is promoted in all denominations of Christians, and as much in those who are repugnate to the state as in those which are encouraged by it. It has been also said, that the subject of religion is so interesting to the generality of mankind, that if government did not interfere, the contention about it would be so violent, that the public peace could not be preserved. To this argument in favour of establishments, it has been replied, that these contents are much increased by the favour shewn to one mode of religion, and the approbation which is consequently thrown on the rest; and that, where temporal interest is not concerned, mere opinions will not occasion any differences at which government need to be alarmed. Christianity was introduced and established, and subsisted for about three hundred years, without any favour or protection from the governing powers; and the example of America, in some provinces of which there is, strictly speaking, no establishment of religion, and in which numerous forms of religion are openly professed, serves to shew, that the want of an establishment is attended with no danger to the state. It is farther objected, that the state, by undertaking the care of religion, the truth and utility of which will, under providence, endure its permanence, has taken upon itself a great, dangerous, and unnecessary burden; and from its jealousy of sectaries, often deprives itself of the services of some of its most capable subjects; and at some times it has been induced to persecute and destroy them, because if they were left free, and even suffered to live, it was apprehended their principles might spread to the ruin of the establishment. To the national establishment of our own country, the enlightened advocates of which abhor and disapprove tolerance and perfecution, it has been objected, that it deprives the people of the choice of their own teachers and pat- tors; that it imposes subscription to creeds of doubtful evidence, and the observance of forms of questionable utility, on its own ministers; that it renders the support of them burdensome to those who adhere themselves to their labours, and to others who derive no benefit from them; and that it excludes by obnoxious statutes a considerable class of loyal subjects from offices which they are competent to discharge, as well as emoluments and honours, which they have a right to participate. See Disentente, Subscription, Test, and Tyranny.

We now proceed to state the arguments that have been urged in favour of national establishments of religion; and we shall here avail ourselves of the reasoning of an excellent writer, who has done ample justice to the subject, and who, at the same time, has discussed it with a liberality and moderation, which have a tendency to reconcile those whose sentiments may be different from his own. "A religious establishment," he says, "is no part of Christianity; it is only the means of inculcating it." It cannot be proved, that any form of church government has been laid down in the Christian, as it had been in the Jewish scriptures, with a view of fixing a constitution for succeeding ages; and which constitution, consequently, the disciples of Christ would, everywhere, and at all times, by the very law of their religion, be obliged to adopt. Certainly no command for this purpose was delivered by Christ himself; and though the apostles ordained bishops and presbyters among their first converts, and appointed also deacons and deaconesses, investing them with functions different from any that now subsist, such offices were at first erected in the Christian church, as the good order, the instruction, and the exigencies of the society at that time required, without any declared design of regulating the appointment, authority, or distinction of Christian ministers under future circumstances. After this concession, our author founds the authority of a church establishment in its utility; and in judging of the comparative excellence of different establishments, he suggests, that the single view, under which we ought to consider any of them, is that of "a scheme of instruction," and the single end we ought to propose by them is, "the preservation and communication of religious knowledge." Every other idea, and every other end that have been mixed with this, as the making of the church an engine, or even an ally of the state; converting it into the means of strengthening, or of diffusing influence; or regarding it as a support of regal, in opposition to popular forms of government, have served only
to debate the institution, and to introduce into it numerous corruptions and abuses. The notion, says our author, of a religious establishment comprehends three things, a clergy, in order of men excluded from other professions to attend upon the offices of religion; a legal provision for the maintenance of the clergy; and the confining of that provision to the teachers of a particular sect of Christians. Without these, there exists no national religion, or established church, according to the sense which these terms are usually made to convey. He, therefore, who would defend ecclesiastical establishments, must shew the separate utility of these three essential parts of their constitution. Under the first head he maintains, that the knowledge and profession of Christianity cannot be maintained in a country without a class of men set apart by public authority to the study and teaching of religion, and to the conducting of public worship; and that for these purposes they should be precluded from other employments; and that of course they ought to derive a maintenance from their own. If they depended for this maintenance upon the voluntary contributions of their hearers, he is of opinion, that few would ultimately contribute anything at all. To the consideration of the difficulty with which congregations would be established and upheld upon the voluntary plan, he adds, that of the condition of those who are to officiate in them. Preaching, he thinks, would in this case become a kind of begging; and the preacher, being at the mercy of his audience, would be obliged to adapt his doctrines, and also his style and manner of preaching, to the pleasure of a capricious multitude: and to live in constant bondage to tyrannical and insolent directors; which he could not do without a sacrifice of principles, and a deprivation of character. Admitting these circumstances to be fairly stated, which perhaps an objector would reluctantly allow. Dr. Paley concludes, that a legal provision for the clergy, compulsory upon those who contribute to it, is expedient; and then proceeds to inquire, whether this provision should be confined to one sect of Christians, or extended indifferently to all. This question, it should be recollected, can never offer itself where the people are agreed, in their religious opinions, and ought never to arise, where a system of doctrines and worship may be so framed as to comprehend their disagreements, and which might satisfy all by uniting all in the articles of their common faith, and in a mode of divine worship that omits every subject of controversy or offence. Where such a comprehension is practicable, the comprehending religion ought to be made that of the state. But where this comprehension is impracticable, and separate congregations and different sects must continue in the country, the question fairly recurs, whether, under such circumstances, the laws ought to establish one sect in preference to the rest; that is, whether they ought to confer the provision and support to the maintenance of religion upon the teachers of one system of doctrines alone. This question is intimately connected with, and in a great measure dependent upon, another; and that is, in what way, or by whom, ought the ministers of religion to be appointed? In that species of patronage which subsists in this country, and which allows private individuals to nominate teachers of religion for districts and congregations, to which they are absolute strangers, some sort should be proposed to the persons nominated, in order to prevent that discordance of religious opinions that might otherwise arise between the several teachers and their respective congregations. The requisition of subscription, or any other test by which the national religion is guarded, may be considered merely as a restriction upon the exercise of private patronage. Wherein, therefore, this constitution of patronage is adopted, a national religion, or the legal preference of one particular religion to all others, must almost necessarily accompany it. If we suppose that the appointment of the ministers of religion was in every parish left to the choice of the parishioners, might not this choice be safely exercised, without its being limited to the teachers of any particular sect? The effect, says our author, of such a liberty must be, that a Papist, or a Presbyterian, a Methodiift, a Moravian, or an Anabaptist, would successively gain possession of the pulpit, according as a majority of the party happened at each election to prevail; and on every choice, it is apprehended, that violent conflicts would be renewed, and bitter animosities be revived. If the state appoint the ministers of religion, this constitution will differ little from the establishment of a national religion; for the state would undoubtedly appoint only those whose religious opinions, or rather whose religious denomination, agree with its own; unless it be thought that religious liberty would derive any advantage from transferring the choice of the national religion from the legislature of the country to the magistrate who administers the executive government. The only plan which seems to render the legal maintenance of a clergy practicable, without the legal preference of one sect of Christians to another, is that of an experiment which has been attempted (and which is said to have succeeded) in some of the new states of North America. The nature of the plan is thus described. A tax is levied upon the inhabitants for the general support of religion; the collector of the tax goes round with a registrar in his hand, in which are inserted, at the head of so many different columns, the names of the several religious sects that are professed in the country. The person who is called upon for the assessment, as soon as he has paid his quota, subscribes his name in which of the columns he pleases; and the amount of what is collected in each column is paid over to the minister of that denomination. In this scheme it is not left to the option of the subject, whether he will contribute, or how much he shall contribute, to the maintenance of a Christian minister: it is only referred to his choice to determine by what sect his contribution shall be received. The above arrangement, says Paley, is undoubtedly the best that has been proposed upon this principle; it bears the appearance of liberality and justice; and it may contain some solid advantages. But our author thinks that its inconveniences will be found to overbalance all its recommendations. It is far less compatible with the first requisite in an ecclesiastical establishment, which is the division of the country into parishes of a commodious extent. If the parishes be small, and ministers of every denomination be stationed in each, which the plan seems to suppose, the expense of their maintenance will become too burdensome a charge for the country to support. If, for reducing the expense, the districts be enlarged, the place of assembling will, in some cases, be too far removed from the residence of the persons who ought to reforit to it. Besides, if the pecuniary fuccefs of the different teachers of religion be made to depend upon the number and wealth of their respective followers, this would naturally generate friaries and indecent jealoufies among them, as well as produce a politerical and profelyting spirit, founded in or mixed with views of private gain; which would both deprave the principles of the clergy, and distract the country with endless contentions. It is not expedient, says our author, to establish a national religion, that is, one sect in preference to all others, some sect, by which the teacher of that sect may be distinguished from the teachers of different sects, appears to be an indifpenfable consequence. The existence of such an establishment
REX. the very notion of a national religion in- cludes that of a test. But the necessity of a test has fur- nished to almost every church a pretence for extending, mul- tiplying, and continuing such tests beyond what the occasion justified. For though some purports of order and tran- quility may be answered by the establishment of creeds and confessions, yet they are at all times attended with serious inconveniences. They check inquiry; they violate liberty; they enframe the confinements of the clergy, by holding out temptations to prevarication; and in precepts of time, they contradict the opinions of the church, whose doctrines they profess to contain; and they often perpetuate the prostration of facts and tenets, from which any danger has long ceased to be apprehended. Although tests and subscriptions may not be abolished, they should be made as easy and simple as possible. They should be adapted from time to time to the varying sentiments and circumstances of the church in which they are received; nor should they at any time advance one step farther than some subsisting necessity requires. Promises of conformity to the rites, liturgy, and offices of the church, if sufficient to prevent confusion in the celebration of divine worship, should be accepted in the place of stricter subscriptions. If any agreements, not to preach certain doctrines, nor to revive certain controversies, denominated articles of peace, would exclude inexcusable alterations amongst the national clergy, and also secure to the public teaching of religion as much of uniformity and quiet as is necessary to edification; then conformations of faith ought to be converted into articles of peace. In a word, it ought to be held, says Dr. Paley, a sufficient reason for relaxing the terms of subscription, or for dropping any or all of the articles to be subscribed, that no present necessity requires greater strictness.

It is a question that has been long agitated in the reformed churches of Christendom, whether a parity amongst the clergy, or a distinction of orders in the ministry, be more conducive to the general ends of the institution? Our author is inclined to the latter alternative, for reasons which he has stated.

In discussing the subject of a national establishment of religion, the right of the civil magistrate to interfere at all in matters of religion offers itself to consideration; and although this right may be acknowledged whilst he is employed solely in providing means of public instruction, it may be questioned whether he should inflict penalties, and impose restraints or incapacities on the account of religious distinctions. Our author, deducing the authority of civil government from the will of God, and inferring that will from public expediency alone, concludes that the jurisdic- tion of the magistrate is limited by no consideration but that of general utility; or that whatever be the subject demanding regulation, it is lawful for him to interfere, whenever his interference, in its general tendency, appears to be conducive to the common interest. Our author conceives, that there is nothing in the nature of religion, as such, which exempts it from the authority of the legislator, when the safety or welfare of the community requires his interposition. To the objection, that religion, pertaining to the interests of a life to come, lies beyond the province of the civil go- vernment, the office of which is confined to the affairs of this life, Dr. Paley replies, that when the laws interfere even in religion, they interfere only with temporals; their effects terminate, their power operates only upon those rights and interests, which confessedly belong to their disposal. He proceeds to observe, probably without satisfying the ob- jector, "that the acts of the legislator, the edicts of the prince, the sentences of the judge, cannot affect my sa- vation; nor do they, without the most absurd arrogance, pretend to any such power: but they may deprive me of liberty, property, and even of life itself, on account of my religion; and however I may complain of the injustice of the sentence, by which I am condemned, I cannot allege that the magistrate has transgressed the boundaries of his jurisdiction; because the property, the liberty, and the life of the subject, may be taken away by the authority of the laws, for any reason, which, in the judgment of the legisla- ture, renders such acts necessary to the common welfare. Moreover, as the precepts of religion may regulate all the offices of life, or may be so contrived as to extend to all, the exemption of religion from the control of human laws might afford a plea, which would exclude civil government from every authority over the conduct of its subjects. Religious liberty is like civil liberty, not an immunity from restraint, but the being restrained by no law, but what in a greater degree conduces to the public welfare."

By way of qualifying this reasoning, which may be thought exceptionable, Dr. Paley observes, that "it is right to obey God rather than man."—When human laws interfere their direction in matters of religion, by dic- tating, for example, the object or the mode of divine worship; by prohibiting the profession of some articles of faith, and by executing that of others; they are liable to clash with what private persons believe to be already settled by precepts of revelation, or to contradict what God himself, they think, hath declared to be true. In this case, on whichever side the mistake lies, or whatever plea the flate may allege to justify its edicts, the subject can have none to execute his compliance. The same consideration also points out the distinction, as to the authority of the state between temporals and spirituals. The magistrate is not to be obeyed in temporals more than in spirituals, where a re- pugnance is perceived between his commands, and any credited manifestations of the divine will; but such repug- nancies are much less likely to arise in one case than in the other. The general proposition laid down by our author is as follows: "That it is lawful for the magistrate, to interfere in the affairs of religion, whenever his inter- ference appears to him to conduct, by its general tendency, to the public happiness." To others this proposition will appear to be in many respects exceptionable. The magi- strate of course is to be the judge, what are the occasions in which he may interfere; and these occasions will occur whenever he pleases. Dr. Paley has therefore endeavoured to guard it against misapprehension and misapplication. Having stated, that it is the general tendency of the mea- sure, or, in other words, the effects which would arise from the measure being generally adopted, that fixes upon it the character of rectitude or injustice, he then proceeds to in- quire what is the degree and the sort of interference of secular laws in matters of religion, which are likely to be beneficial to the public happiness. In settling this point he premises two maxims: the first is, that any form of Christianity is better than no religion at all; and the second is, that of different systems of faith, that is the best which is the truest. From the first proposition it is inferred, that when the state enables its subjects to learn some form of Christianity by distributing teachers of a re- ligious system throughout the country, and by providing for the maintenance of these teachers at the public expense; that is, when the laws establish a national religion, they exercise a power and interference, which are likely, in their general tendency, to promote the interest of mankind:
But after the right of the magistrate to establish a particular religion has been, upon this principle, admitted; a doubt arises, whether the religion he ought to establish be that which he himself professes, or that which he observes to prevail amongst the majority of the people. Assuming it to be an equal chance, which of the two religions, that of the magistrate or that of the people, contains more of truth, it becomes a consideration of some importance, to which arrangement we may attach the greater efficacy; that of an order of men appointed to teach the people their own religion, or to convert them to another; and as in our author's opinion the advantage lies on the side of the former scheme, it becomes the duty of the magistrate, in the choice of the religion which he establishes, to consult the faith of the nation rather than his own. For our author's reasoning on other topics connected with a national establishment of religion, we refer to the articles Subscription, Test, and Toleration. He closes the discussion of the general subject with the following summary of his argument: the result of our examination of those general tendencies, by which every interference of civil government in matters of religion ought to be tried, is this: "That a comprehensive national religion, guarded by a few articles of peace, and conformity, together with a legal provision for the clergy of that religion; and with a complete toleration of all dissenters from the established church, without any other limitation or exception, than what arises from the conjunction of dangerous political dispositions with certain religious tenets, appears to be, not only the most just and liberal, but the wisest and safest system, which a state can adopt: inasmuch as it unites the several perfections, which a religious constitution ought to aim at—liberty of conscience, with means of instruction; the progress of truth, with the peace of society; the right of private judgment, with the care of the public safety." Paley's Principles of Moral and Political Philosophy, vol. ii. ch. 10.

In most countries where religion is established, it is that of the majority of the people; and on this principle the writers in defence of ecclesiastical establishments vindicate them. But in a part of the united kingdom of Great Britain, viz. in Ireland, we have a remarkable exception to this rule. There the established religion is not that of the majority, but of a small minority of the people. Ever since the reformation of the members of the church of England have kept the possession of the tithes of the whole island, where they have long despaired of bringing the people over to that religion for which they pay so dear.

In connection with the national establishment of religion we shall here remark, that in this country the care which government takes of religion extends itself to the business of education, confining the universities, which are supported by the national funds, to the education of the members of the church of England, and rigorously excluding all sectaries, either by requiring subscription to the thirty-nine articles at the time of matriculation, or of taking certain degrees, or obliging the students to attend the service of the established church, and to declare that they are bona fide members of it.

Among the offences against religion enumerated by judge Blackstone, and punishable by the laws of England, are apostacy and heresies, which see respectively; and also those which affect the established church. These latter are either positive or negative: positive by reviling its ordinances, or negative, by non-conformity to its worship. See Reviling, &c. Common Prayer, Non-conformists, Dissenters, Papists, and Popery. See also Blasphemy, Profaneness, Consecration and Witchcraft, Religious Impostors, Sunday, False Prophecies, Drunkenness, Lewdness, and Simony.

Religion, again, is applied to a military order, consisting of knights who live under some certain rule, &c. In this sense we say, the religion of Malta, &c. See Malta.

Religion is sometimes also used for a convent. Thus, we say, there are religions of men, i.e. monks; religions of women, i.e. nuns. Religion, Thes, used absolutely, denotes the Reformed in France. Thus, they say, d'Ablancourt and Dacier were of the religion. See Huguenots.

Religious, in a general sense, something that relates to religion.

We say, a religious life, religious society, &c. Churches and church-yards are religious places. A religious war is also called a crusade; which see.

Religious is more particularly used for a person engaged by solemn vows to the monastic life; or a person shut up in a monastery, to lead a life of devotion and austerity, under some rule or institution.

The male religious we popularly call monks and friars; the female, nuns and cananejess. See Canon, Monk, Nun, &c.

M. Nicole observes, that some domestic charitons, and a certain pride, which leads people to abscend when they cannot make a figure to their mind, make as many religious as real piety. He adds, that a girl must often be made a religious for no other reason, but because she cannot be married answerable to her condition.

Great influence, however, may be attributed to enthusiasm and superstition, and to those mislaken notions of duty and of perfection of character, which have often originated in these sources, and which have produced effect on human minds of a peculiar temperament and disposition. Whilst no kind of argument can justify this retirement from the world, and total seclusion from the occupations and pleasures of social life, it would manifest a want of candor, as well as ignorance of human nature, indiscriminately to condemn all who have devoted themselves to such a kind of indolent and useless life.

A religious cannot make any will. By the council of Trent, a religious may reclaim his vows within five years.

Anciently the religious were all laymen, and it was even prohibited them to take up orders. In 1557, the parliament of Paris made a difficulty of receiving a bishop of Lyo to the oath of a duke and peer, by reason of his being a religious: yet a religious, being promoted to a bishopric, is thenceforth secularized or dispensed from the observation of his rule.

In ancient deeds and conveyances of lands, we often find the feller restrained from giving or alienating it, viris religiosis, vel Judaeis, to religious, or to Jews; to the end the land might not fall into mortmain; which see.

In a memorial directed by king John to his vicarouns, they are ordered to proclaim through their respective counties, that nobody, as they love their bodies and cattle, incur the religious or clerks, either in word or deed, on penalty of being hanged up on the next oak. "Nulli, neque diligent corpora et catalis, salubri sic vocet accuratissimis et pacis religiosis vel clericis. Si quem inde attingere possimus, ad proximam quercuam sum fusiendo faciemos." Religious Houscs, denote houses set apart for religious purposes,
purposes, such as monasteries, churches, hospitals, and all other places where charity is extended to the relief of the poor and orphans, or for the use or exercise of religion. See "Notitia Monastica," or "A short History of the Religious Houses in England and Wales," by Tanner, 8vo.; in which, according to the alphabetical order of counties, is accurately given a full account of the founders, the time of foundation, tutelary fants, the order, the value, and the dissolution; with reference to printed authors and MSS. which prefer any memoirs relating to each house; with a preference of the institution of religious orders. Cowl.

Religious Impostors. See Impostors.

Religious Order. See Order.

Most military orders pretend likewise to be religious; as the of Malta, who make vows, &c. See Malta.

Relinquishment, in Law, is a forfaking, abandoning, or giving over. It hath been adjudged, that a perfon may relinquish an ill demand in a declaration, &c. and have judgment for that which is well-demanded.

Reliquia, the remainder or debt, which a perfon finds himself debtor in, upon the balancing or liquidating an account.

Hence reliquitary, the debtor of a reliquia; as also a perfon who only pays piece-meal.

The term reliquia is pure Latin. Reliquiae, Relics, in Antiquity, the ashes and bones of the dead, which remained after burning their bodies; and which they very religiously gathered, and put into urns, and afterwards deposited in tombs. See Relics.

Reliquary, a shrine or casket, in which the relics of a dead saint are kept.

Reliquie. See Relics.

Reliquia, in Natural History, a term used to express the fossil remains of certain substances found in different parts of the earth. In the article Petrifactions we have given the Linnean division of the five clafs of minerals, and a pretty full description of the eight genera into which it is divided. In this place we shall present our readers with a very brief view of Mr. Martin's "Systema Reliquiorum." He considers the regnum fossilie, or fossilie kingdom, to be divided into five clafs, viz.

1. Reliquia, or fossil remains from animals or plants.
2. Terra, earths.
4. Inflammables, inflammable substances.
5. Metalla, metallic substances.

The reliquia he divides into two orders, viz. animal and vegetable remains: of the former he gives eight genera; of the latter only one genus, which are as follow:

Order I. Reliquia Animalia.

Insecta.

Genus 1. Mammalolithus, or remains of Mammalia.
2. Ornitholithus, - - Birds.
3. Amphibiolithus, - - Amphibia.
4. Ichthyolithus, - - Fishes.
5. Entolithus, - - Insects.
6. Helmintholithus, of the parts of worms not fabricated.

Fabricata.

7. Conchylolithus, or remains of Testacea.
8. Erismatolithus, of fulciments, or fabricated supports of worms.

Order II. Reliquia Vegetalia.

9. Phylolithus, the remains of Plants.

Mr. Martin has given certain fundamental principles, on which he conceives the study of reliquia may be scientifically conducted: these are as follow.

1. All natural bodies without life found on or beneath the surface of the earth, and which are not susceptible of petrifaction, belong to the fossilie kingdom, and are either reliquia or minerals. Fossilis are usually denominated "bodies defitute of an organic structure:" now though it be admitted that all fossilis are, according to the common acceptation of the term, unorganized, they are not defitute of the structure which distinguishes an organized body. This being admitted, it follows that a line must be drawn between animal and vegetable matter recently buried in the earth, and which has acquired a genuine fossil character. This line will depend perhaps on petrifaction, to which even organic substances, after they have become fossil, are no longer subject.

2. An organic structure, whether of a plant or animal, is the essence of an extraneous fossil or reliquia. By this alone it is characterized, or distinguished from a mineral.

3. It is the organic form alone on which the arrangement of reliquia must be founded. Every system of natural bodies should assume for its basis but one principle, and this should be drawn from the most essential characteristics of the bodies under arrangement. It is on this account the form is pointed out as furnishing the only genuine principle, on which the classification of reliquia can be established.

4. The primary division of the arrangement, viz. orders, genera, &c. should agree with such natural divisions of plants and animals as are determinable by the form of the fossil subjects.

5. The specific differences of reliquia depend on the specific differences of form in the original bodies. One species of plant or animal can give but one real or genuine species of extraneous fossil. For if the essence of the reliquium be an organic form, its other affections, arising from substance, mode, and soil, are accidental, and cannot be used as specific distinctions, which must always depend on something essential to the body which we wish to determine. Form, therefore, must furnish specific differences of reliquia, and it of course follows that there will be as many genuine species of reliquia as there are genuine specific forms in the animal and vegetable prototypes or originals; and that the number of fossil species is not increased by a separation of parts, or other accidental circumstances to which the original bodies may have been subjected during their change into fossil.

6. Specific distinctions of reliquia being founded only on the organic form, it follows, that their geological and mineralogical affections, with their modal diversities, merely characterize specimens.

7. The specific descriptions of reliquia are to be given according to the principles of botany and zoology. Those of the specimens, according to the principles of mineralogy and geology. The essential form of the reliquium must be distinguished from the accidental, that is, the form of the original body, from that which has arisen in the fossil from the mode of mineralization, the constituent substance, and the foil of the specimen.

8. The nomenclature of reliquia should manifest the extent of the present state of knowledge with respect to the original bodies.

To what has been said, we shall add an account of our author's "Delineations of Reliquia."

The leading parts in the delineation of a reliquium are...
the specific character or diagnosis, and the general description.

The specific character contains the marks that distinguish the species to which they belong, from all others in the same genus. Specific characters of reliquia should be so constructed as to distinguish permanent from temporary species; and those whose originals have not, as yet, been discovered. The specific character of the recent species of plants or animals frequently depends on parts often or constantly wanting in the fossil subject. When that is the case, another diagnosis must be given to distinguish the reliquia; that of the recent species being marked as a parenthesis. The generic and specific names are prefixed to the specific character. And, generally, the name of the family, or subdivision of the genus to which the reliquia belongs: after which it is to be detailed in distinct clastes. 1. The synonyms or names by which the species has been distinguished by authors, with references to the figures given of it. 2. The varieties of the species, with their synonyms. 3. The vernacular name. 4. The mode or rate in which the reliquia is found. 5. Its foil or geological situation. 6. Its geographic situation, and then the general description.

The description delineates in appropriate terms all the parts constituting the essential form of the reliquia, according to their number, figure, proportion, and situation: it must primarily refer to the original of the reliquia, as no null or perfect delineation of the species can be given, until the nature of its prototype be ascertained.

The terms employed in describing reliquia, which derive their form from the external parts of animals and plants, must be those used by zoologists and botanists of the Linnean school. But those which derive their form from the internal parts of organic bodies, are to be described in such terms as anatomists would use in distinguishing the same parts in the recent subject.

As appendant parts to the general description of the reliquia must be given, 1. An enumeration of the species which exhibit the various accidental forms under which the species has been found. 2. An enumeration of the various substances which have been observed as constituting the reliquia and its matrix.

Having given this brief account of Mr. Martin's scientific delineations of reliquia, we shall present our readers with the substance of two very interesting communications sent to the Royal Society since the printing of the article Permiaccretion. Of these, the first is "An Account of some Organic Remains found by Mr. Trimmer, near Brentford, in Middlesex."

"The specimens," says Mr. Trimmer, "have been collected from two fields, not contiguous to each other; to avoid confusion, I shall take each field separately, first describing the first as far as they have come within my knowledge, and afterwards I shall speak of the organic remains as they were respectively found in these fields."

"The first field is about half a mile north of the Thames at Kew bridge; its surface is about twenty-five feet above the Thames at low water. The flata here are, first, sandy loam from six to seven feet, the lowest two feet being calcareous. Second, sandy gravel, a few inches only in thickness. Third, loam thinly calcareous, from one to five feet: between this and the next flata, peat frequently intervenes in small patches, on only a few yards wide, and a few inches thick. Fourth, gravel containing water; this flata varies from two to ten feet in thickness, and is always the deepest in the places covered by peat; in these places the lower part of the flata becomes an heterogeneous mass of clay, sand, and gravel, and frequently exhales a disagreeable muddy smell. Fifth, the main flata of blue clay, which lies under this, extends under London and its vicinity; the average depth of this clay has been ascertained, by wells that have been dug through it, to be about two hundred feet under the surface of the more level lands, and proportionately deeper under the hills, as appears from Lord Spencer's well at Wimbledon, which is five hundred and sixty-seven feet deep. This flata, besides figured fossils, contains pyrites and many detached nodules; at the depth of twenty feet there is a regular flata of these nodules, some of which are of very considerable size."

"In the first flata, as far as my observation has extended, no remains of an organized body has ever been found, and as my search has not been very limited, I may venture to say it contains none. In the second flata, snail-shells, and the shells of river fish, have been found, and a few bones of land animals, but of incompossible size, and in such a mutilated state, that it cannot be ascertained to which class they belong. In the third flata, the horns and bones of the ox, and the horns, bones, and teeth of the deer, have been found, and also, as in the second flata, snail-shells, and the shells of river-fish. In the fourth flata were found teeth and bones of both the African and Asiatic elephants, teeth of the hippopotamus, bones, horns, and teeth of the ox."

"A tusk of an elephant measured, as it lay on the ground, nine feet three inches, but, in attempting to remove it, it broke into small pieces. When this flata dips into the clay, and becomes a mixed mass, as before stated, it is seldom without the remains of animals. In the fifth flata, namely, the blue clay, the extraneous fossils are entirely marine, with the exception of some specimens of fruit and pieces of petrified wood, the latter of which may be considered as marine, because, when of sufficient size, they are always penetrated by teredines. The other fossils from this flata are mammal, oysters, pinnæ marines, crabs, teeth and bones of fish, and a great variety of small marine shells; this flata has been penetrated hitherto in this field only to the depth of thirty feet, throughout which the specimens found were dispersed without any regularity.

"The second field is about one mile to the westward of the former, one mile north of the Thames, and a quarter of a mile to the southward of the river Brent; its height above the Thames, at low water, is about forty feet. The flata are, first, sandy loam, eight or nine feet, in the lowest three feet of which it is slightly calcareous. Second, sand, becoming coarser towards the lowest part, and ending in sandy gravel from three to eight feet. Third, sandy loam highly calcareous, having its upper surface nearly level, but gradually increasing in thickness from a feather-edge to nine feet. Below this are two flata of gravel and clay, as in the other field; but as these flata have been only occasionally penetrated in digging for water, nothing therefore is known with respect to them, but that they exist there."

"In the first flata, as in the other field, no organic remains have been observed. In the second, but always within two feet of the third flata, have been found the teeth and bones of the hippopotamus, the teeth and bones of the elephant, the horns, bones and teeth of several species of deer, the horns, bones, and teeth of the ox, and the shells of river-fish.

"The remains of hippopotami are so extremely abundant, that, in turning over an area of 120 yards in the present field, parts of six tusks have been found of this animal, besides a tooth and part of the horn of a deer, part of a tusk, and part of a grinder of an elephant, and the horns, with a small part of the skull, of an ox. One of these horns I had an
an opportunity of measuring as it lay on the ground, and
found it to be 4 feet in length, and five inches in diameter
at the large end; it was found impracticable to remove
it, otherwise than in fragments, which I have preserved,
and have hopes of being able to put a considerabl part
of it together. The immense size of this horn is rendered
more remarkable by another horn from the same spot,
which measures but six inches in length. Though this
hornt is so extremely productive of the remains of ani-
mals, yet there are but few good cabinet specimens from it,
owing, it is prefixed, to their having been crushed at the
time they were buried, and to the injury they have since
received from moisture. It is necessary to remark, that
the gravel-stones in this stratum do not appear to have been
rounded in the usual way by attrition, and that the bones
must have been deposited after the fiish was off, because,
in no instance, have two bones been found together which
were joined in the living animal; and further, that the bones
are not in the leaf worm, as must have been the case had they
been exposed to the walk of a sea-beach.

"In the third stratum, viz. calcareous loam, have been
found the horns, bones and teeth of the deer, the bones and
teeth of the ox, together with mail-hells, and the shells of
river-fish.

"Brentford, in the neighbourhood of which are the fields
I have mentioned, is situated on the north bank of the Thames,
and is six miles west of London.

"The fall of the Thames from Brentford to its mouth at
the Nore, is estimated at seven feet."

The next communication is in relation to a fossil human
skeleton, found imbedded in lime-stone lately brought from
the island of Guadaloupe by the honourable Sir Alexander
Cochrane, and presented to the admiralty, to the British Mu-
seum. Of this highly curious specimen Mr. Konig has given
an account that, to naturalists, will be regarded as highly
important and interesting.

"On the history of the strata produced by the more recent
catastrophes of the globe," says Mr. Konig, "most light
has been thrown by the indefatigable exertions of M. Cuvier.
Superlatively skilled in comparative anatomy, this gentleman
has succeeded in determining the fossil bones of no less than
78 species, of which 12 are identified with known species,
and the remainder strongly resemble existing species,
although their identity has not been completely ascertained.

From the multiplied observations which this naturalist has
communicated in his numerous memoirs, we may gather that
the viviparous quadrupeds appear at a much later period in
the fossil state than the oviparous; the latter being pro-
bably coeval with the fishes, whilst the former are found
only in the newest formations, in which, according to
Brongniart and Cuvier's interesting discovery, marine beds
are observed to alternate with those of fresh water, and which
(in the neighbourhood of Paris) overlay the coarse shell
lime-stone, which constitutes the last strata formed, as it
would appear, by a long and quiet stay of the sea on our
continent.

"All the circumstances under which the known depo-
sitions of bones occur, both in alluvial beds and in the caverns
and fissures of limestone, tend to prove, that the animals
to which they belonged met their fate in the very places
where they now lie buried. Hence, it may be considered
as an axiom, that man, and other animals, whose bones are not
found intermixed with them, d.d not co-exist in time and
place. The same mode of reasoning would further justify us in
the conclusion, that, if those catastrophes which overwhelmed
a great proportion of the brute creation were general, as
geognostic observations in various parts of the world render
probable, the creation of man must have been posterior to
that of those genera and species of mammalia which per-
ished by a general cataclysm, and whose bones are so
thickly diffused in the more recent formations of rocks.

"The human skeletons from Guadaloupe are called Calabli
by the natives of that island; a name said to have been that
of an ancient tribe of Caribs of Guiania, but which, accord-
ing to a plausible conjecture, originated in the substitu-
tion of the letter / instead of r, in the word Caribbee. No men-
tion is made of them by any author except general Erouflf,
in a letter to M. Pujas St. Fond, infared in vol. v. (1805)
of the Annales du Museum, and by M. Lavalle, in his
Voyage a la Trindad, &c. published in 1813. The former
of these gentlemen writes that, on that part of the wind-
ward side of the Grande-Terre, called La Moule, skeletons
are found enveloped in what he terms "Muffles de madre-
poles pétrefiés," which being very hard, and situated within
the line of high water, could not be worked without great
difficulty, but that he expected to succeed in causing some
of these fossils to be detached, the measurements of which
he states to be about eight feet by two and a half.

"The block brought home by Sir Alexander Cochrane ex-
actly answered this account with regard to the measure-
ments; in thickness it was about a foot and a half. It
weighed nearly two tons; its shape was irregular, approach-
ing to a flattened oval, with here and there some concavities,
the largest of which, as it afterwards appeared, occupying the
place where the thigh-bone had been situated, the lower part
of which was therefore wanting. Except the few holes
evidently made to afflat in raising the block, the masons here
declared, that there was no mark of a tool upon any part of
it; and, indeed, the whole had very much the appearance of
a huge nodule disengaged from a surrounding mass.

"The situation of the skeleton in the block was so super-
fluous, that its presence in the rock on the coast had probably
been indicated by the projection of some of the more eleved
parts of the left fore-arm.

"The skull is wanting; a circumstance which the more
is to be regretted, as this characteristic part might pos-
ibly have thrown some light on the subject under considera-
 tion, or would, at least, have settled the question, whether the
skeleton is that of a Carib, who used to give the frontal
bone of the head a particular shape by compression, which
had the effect of depressing the upper, and protruding the
lower edge of the orbits, in order to make the direction of their
opening nearly upwards, or horizontal, instead of vertical.

"The vertebrae of the neck were lost with the head. The
bones of the thorax bear all the marks of considerable con-
fusion, and are completely dislocated. The seven true ribs
of the left side, though their heads are not in connection
with the vertebrae, are complete; but only three of the false
ribs are observable. On the right side only fragments of
these bones are seen; but the upper part of the seven true
ribs of this side are found on the left, and might at first sight
be taken for the termination of the left ribs. The right ribs
must, therefore, have been violently broken, and carried over
to the left side, where, if this mode of viewing the subject
is correct, the femur must likewise be concealed below
the termination of the ribs. The small bone dependent above
the upper ribs of the left side, appears to be the right clav-
icle. The right os humeri is lost; of the left nothing
remains except the condyles in connection with the fore-arm,
which is in the state of proration; the radius of this side
exits nearly in its full length, while of the ulna the lower
part only remains, which is considerably pushed upwards.
Of the two bones of the right fore-arm, the inferior termi-
ations
tions are seen. Both the rows of the bones of the wrists are lost, but the whole metacarpus of the left hand is displayed, together with part of the bones of the fingers; the first joint of the fore-finger rests on the upper ridge of the os pubis, the two others, detached from their metacarpal bones, are propelled downwards, and situated at the inner side of the femur, and below the foramen magnum &c. of this side. Veiliges of three of the fingers of the right hand are likewise visible, considerably below the lower portion of the forearm, and close to the upper extremity of the femur. The vertebrae may be traced along the whole length of the column, but are in no part of it well defined. Of the os sacrum, the superior portion only is distinct; it is dilated from the last vertebra and the ilium, and driven upwards. The left os ilium is nearly complete; but shattered, and one of the fragments depressed below the level of the rest; the os pubis, though well defined, are gradually lost in the mafs of the stone. On the right side the os innominatum is completely shattered, and the fragments are funk; but towards the acetabulum, part of its internal cellular structure is discernible.

"The thigh-bones and the bones of the leg of the right side are in good preservation, but being considerably turned outwards, the fibula lies buried in the stone, and is not seen. The lower part of the femur of this side is indicated only by a bony outline, and appears to have been deflected by the compact lime-flone that fills the cavities both of the bones of the leg and thigh, and to the expansion of which these bones probably owe their present shattered condition. The lower end of the left thigh-bone appears to have been broken and lost in the operation of detaching the block; the two bones of the leg, however, on this side are nearly complete: the tibia was split almost the whole of its length a half below the external edge, and the fissure being filled up with lime-flone, now presents itself as a dark-coloured straight line. The portion of the flone which contained part of the bones of the tarsus and metatarsus was unfortunately broken; but the separate fragments are preferred.

"The whole of the bones, when first laid bare, had a mouldering appearance, and the hard surrounding stone could not be detached, without frequently injuring their surface; but, after an exposure for some days to the air, they acquired a considerable degree of hardeness. Sir H. Davy, who subjected a small portion of them to chemical analysis, found that they contained part of their animal matter, and all their phosphatate of lime. Here follows an exact description of the rock, in which the fossil skeleton is found. The attention of geologists being now directed towards this object, it may be expected that a scientific examination of the circumstances under which this lime-flone occurs, will not fail ere long to fix its age, and aflign to it the place it is to occupy in the feries of rocks. All our present information respecting the Grande Terre of Guadalupe amounts to this, that it is a flat lime-flone country, derived principally from the detritus of zoophytes, with here and there single hills (mornes) composed of shell lime-flone; while Guadalupe, properly so called, separated from the upper part by a narrow channel of the sea, has no truces of lime-flone, and is entirely volcanic."

M. Lavaiss, alluded to above as the only author who mentions the galibies, except general Ernouf, speaks of the bed of lime-flone which includes them, as the most remarkable of the calcareous rocks in the Leeward islands. Mr. Konig, therefore, expected to find in his work an exact statement of its mode of occurring; but the only positive information he could collect from this author is, that the bed is a kilometre (nearly an English mile) in length, and that it is covered by the sea at high water. According to him, no trace of shells or organized bodies is discoverable in this rock; but in lieu of these, he was fortunate enough to meet with mortars, petriels, butchers, &c. of a basaltic or porphyritic rock, which, we are informed, were petrielled (petrified). From this very vague account, we should not be induced to lay much stress upon the circumstance that the position of the skeletons is east-west, and that the spot itself, therefore, have been a cemetery, which time and circumstances have transformed into a hard calcareous rock.

"I have to apologize for this long letter on a subjedt," concludes Mr. Konig, "which may turn out to be interesting only so far, as the human bones from Guadalupe are unquestionably the only bones we are acquainted with that have ever been found imbedded in a hard stone, that does not appear to belong to common flaked or calcareous depositions. This circumstance admits of being easily ascertained by a close inspection of the locality; and I am perfectly of opinion, that a comparison of the nature of the different varieties of shell-fand, with which the neighbourhood of the Caribbean islands abounds, would alone be sufficient to remove many doubts relative to the origin of the bed in question. The sand from thence, which I had an opportunity of seeing, was unlike that of which the stone is composed."

RELL, Mouse, in Zoology, the English name of the white-bellied mouse, with a blackish back and long body. See Myoxus and Glin.

RELLING, in Geography, a town of the duchy of Holstein; 2 miles S.S.E. of Flamenberg.

RELLINGEN, a town of France, in the department of the Mofelle, and chief place of a canton, in the district of Thionville. The place contains 602, and the canton 9360 inhabitants, on a territory of 3125 kilometres, in 36 communes.

RELLINGHAUSEN, a town of Germany, lately belonging to the abbey of Corvey; 16 miles N.E. of Duffeldorf.

RELLINGHUSEN, a town of the duchy of Holstein; 9 miles E. of Itzehoa.

REM, Information in, in Law. See INFORMATION.

REMAGEN, in Geography, a town of France, in the department of the Rhine and Mofelle, and chief place of a canton, in the district of Bonn. The place contains 796, and the canton 7801 inhabitants, in 37 communes.

REMAIGHIAN, a town of Peruia, in the province of Larillan; 10 miles N.W. of Tarem.

REMAINDER, Remanentia, in Law, an estate limited to take effect and be enjoyed after another estate is determined. As if a man seised in fee-simple granteth lands to A for twenty years, and, after the determination of the said term, then to B and his heirs for ever: here A is tenant for years, remainder to B in fee. In the first place, an estate for years is created or carved out of the fee, and given to A; and the residuum or remainder of it is given to B. But both these interests are in fact only one estate; the present term of years and the remainder afterwards, when added together, being equal only to one estate in fee. (Co. Litt. 143.) Thus, also, if land be granted to A for twenty years, and after the determination of the said term to B for life; and after the determination of B’s estate for life, it being limited to C and his heirs for ever: this makes A tenant for years, with remainder to B for life, remainder over to C in fee. In this case also, the first estate, and both the remainders, for life and in fee, are one estate only. Hence it is easy to infer, that no remainder can be limited after the grant of an estate in fee-simple (Plowd. 20. 6)

Vaugh.
Vaugh. 269.) because this is the highest and largest estate that a subject is capable of enjoying; and he that is tenant in fee, hath in him the whole of the estate; a remainder, therefore, which is only a portion, or remainer of the estate, cannot be revised after the whole is disposed of.

The rules that are laid down by law to be observed in the creation of remainders, are as follow. 1. There must necessarily be some particular estate, precedent to the estate in remainder; which particular estate is found to support the remainder. (Co. Litt. 49. Plowd. 25.) 2. The remainder must commence or pass out of the grantor, at the time of the creation of the particular estate. (Litt. § 671. Plowd. 25): as where there is an estate to A for life, with remainder to B in fee; here B’s remainder in fee passes from the grantor at the same time that title is delivered to A of his life-estate in possession. And it is this which induces the necessity at common law of livery of seisin being made on the particular estate, whenever a freehold remainder is created. (Litt. § 66. Co. Litt. 49.) 3. The remainder must vest in the grantee during the continuance of the particular estate, or eo infinito that it determines. (Plowd. 25.)

As if A be tenant for life, remainder to B in tail: here B’s remainder is vested in him, at the creation of the particular estate to A for life: or if A and B be tenants for their joint lives, remainder to the survivor in fee; here, though during their joint lives the remainder is vested in neither, yet, on the death of either of them, the remainder vests instantly in the survivor; whence both these are good remainders. But if an estate be limited to A for life, remainder to the eldest son of B in tail, and A dies before B hath any son; here the remainder will be void, for it did not vest in any one during the continuance, nor at the determination, of the particular estate; and even supposing that B should afterwards have a son, he shall not take by this remainder; for, as it did not vest at or before the end of the particular estate, it never can vest at all, but is gone for ever. (1 Rep. 138.) Hence remainders are either vested or contingent. Vested remainders (or remainders executed, by which a present interest passes to the party, though to be enjoyed in future) are such where the estate is invariably fixed, to remain a determinate perfon after the particular estate is spent. As if A be tenant for twenty years, remainder to B in fee; here B’s is a vested remainder, which nothing can defeat or fet aside. Contingent or executory remainders (by which no present interest passes) are where the estate in remainder is limited to take effect, either to a dubious and uncertain person, or upon a dubious or uncertain event; so that the particular estate may chance to be determined, and the remainder never take effect. (3 Rep. 20.) In the first case, if A be tenant for life, with remainder to B’s eldest son (then unborn) in tail, this is a contingent remainder, because it is uncertain whether B will have a son or not; and if A dies before B’s son is born, the remainder is absolutely gone; even though A leaves his wife big with child, and after his death a posthumous son is born. (Salk. 228. 4 Mod. 282.) But to remedy this hardship, it is enacted by statute 10 & 11 W. III. cap. 16. that posthumous children shall be capable of taking in remainder, in the same manner as if they had been born in their father’s life-time; that is, the remainder is allowed to vest in them, while yet in their mother’s womb. This species of contingent remainder, to a person not in being, must, however, be limited to some one, that may by common possibility, or potestas propinqua, be in eʃe at or before the particular estate determines. (2 Rep. 51.) A remainder to a man’s eldest son, who has done, is good; because by common possibility he may have one: but if it be limited in particular to his son John or Richard, it is bad, if he have no son of that name; for it is too remote a possibility, that he should not only have a son, but the son of a particular name. (5 Rep. 51.) A limitation of a remainder to a bastard before he is born, is not good (Cro. Eliz. 505.): for though the law allows the possibility of having bastards, it presumes it to be a very remote and improbable contingency. In the second case, where land is given to A for life, and in case B survives him, then with remainder to B in fee: here B is a certain perfon, but the remainder to him is a contingent remainder, depending upon the uncertainty of his surviving A. During the joint lives of B and A, it is contingent; and if B dies first, it can never vest in his heirs, but is for ever gone; but if A dies first, the remainder to B becomes vested. Contingent remainders of either kind, if they amount to a freehold, cannot be limited on an estate for years, or any other particular estate, less than a freehold. Thus, if land be granted to A for ten years, with remainder in fee to the right heirs of B, this remainder is void (1 Rep. 130.); but if granted to A for life, with a like remainder, it is good. Contingent remainders may be defeated, by destroying or determining the particular estate upon which they depend, before the contingency happens, by which they become vested. 1 Rep. 66. 155.

In devises by last will and testament, remainders may be created in some measure contrary to the rules here laid down: though our lawyers will not allow such dispositions to be strictly remainders; but call them by another name, that of executory devises, or devises hereafter to be executed. Blackft. Com. book ii. chap. 11. § 3.

Spelman makes the difference between a remainder and a reversion to confift in this; that by a reversion, after the appointed term, the estate returns to the donor, or his heirs, as the proper tenant; whereas by remainder it goes to a third person or stranger.

Or, a remainder is an expectancy, created by act of the parties; whereas a reversion is created by act of law.

The limitations of personal goods and chattels, in remainder after a bequest for life, are permitted in last wills and testaments: so that if a man, either by deed or will, limits his books or furniture to A for life, with remainder over to B, this remainder is good. But where an estate-tail in things personal is given to the first or any subsequent possessor, it vests in him the total property, and no remainder over shall be permitted on such a limitation. 1 P. Wms. 200.

Glanville obseres, that bishops and abbots, in regard their baronies are the king’s alms, cannot give any part of them by way of remainder.

Remainder, Writ of founded in. See Formedon.

Remainder, in Mathematics, is the difference; or that which is left after the taking a lesser number, or quantity, from a greater.

Remal, in Geography, a town of Hindoostan; 18 miles N.W. of Agimere.

Remaland, a town of France, in the department of the Orne, and chief place of a canton, in the district of Mortagne. The place contains 1702, and the canton 11,685 inhabitants, on a territory of 2028 kilomètres, in 12 communes.

Remancipate, To, in Commerce, is to sell or return a commodity to him who first sold it.

Remancipation, Remanctipatio, among the Romans, a form of divorce observed in marriages that had been contracted by consent. This was done by delivering the wife into the husband’s hands; so the marriage was disolved
solved by the husband's re-delivering the wife into any per-
son's hands agreed upon between them.

REMAND, Fr., To, in Military Language, to send back; 
as when a soldier, who has been brought out of prison, or the
guard-houfe, for the purpose of being examined or tried, is
sent back, without any thing final occurring relative to his
case.

REMANO, in Geography, a town of South America, 
in the province of Cordova; 170 miles N. of Cordova.

RE-MARRYING, the repeating of a marriage; or the
going through the solemnities of a second marriage.

Clanpleine and uncanonical marriages are deemed null; 
and the parties are to be re-married in form; at least, it had 
always better be so to avoid disputes.

It was anciently expressly forbid to re-marry in the first 
year of virginy, M. Bayle observes, that a person who 
does not re-marry, is answerable to the public for all the 
time lost in his virginy, or widowhood.

REMBANG, in Geography, a town on the N. coast of 
the island of Java, where the Dutch had a resident merchant.

It yields salt and timber, and was the place where the small 
velvets of the company were built; 45 miles N.E. of Sa-
amang.

REMBERTUS, in Biography, the disciple, friend, and 
 fellow-labourer of Anfarius, styled the apostle of the 
north, was a native of Thrifhot, in Flanders, in the monas-
tery of which, as well as at that of Corby in Wellphalia, 
he efficaciously served as school-maíier. He was one of the first 
pro-

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promoters of Christianness in Denmark, and in or about the year 
860 he became bishop of Ribe. After the death of An-
farius, in 865, he was appointed to the archbishopric of 
Hamburgh, which office he held till his death, in 888. He 

wrote, in conjunction with a friend, the life of Anfarius, 
which is inferred in the first volume of Langebeek's " Scrip-
tores Rerum Danicarum." In this work Rembertus relates 
various facts, not elsewhere to be found, with regard to the 
date of Denmark at that period, but intermixed with fables.

He collected extracts from Gregorius Magnus, whose works 
no longer exist, and he wrote many letters, one of which 
only is to be found in the second volume of Langebeek's 
collection. An account of Rembert's life and miracles is 
given in the same work. A Danish writer, quoted in the 
General Biography, to which we are indebted for this article, 
in speaking of Rembert's labours, says: "here we have not 
s0 much the commencement of Danish literatur, as the seeds 
of it. They were sown by the exertions of Ebbo, Wile-
had, Anfarius, and Rembert, but remained a long time, as 
it were, trodden down by the severe perfections to which the 
Christians were exposed from Gormo the old, and other 
kings; and retarded in their growth by the rudeness and 
barbarism which formed the principal features in the char-
ter of a people, who were fond of roving about on the 
seas to rob and murder, and of feeding and drinking, than 
of reading and writing books. At length, however, the 
seeds which he had scattered took root, sprang up in the 
11th century, and in the 12th and 13th produced abundance 

REMERVILLEIERS, in Geography. See Rame-
evilleiers.

REMBRANDT, VAN RYNS, in Biography, was born 
at a village near Lydn, in 1605. The real name of his 
father was Gerrits; but he acquired that of Van Ryn, 
from having resided in early life at a village upon 
the banks of the Rhine.

The little which this extraordinary artist owed to tuition 
was derived first from Zwaneburg, then from Peter Lall-
man, and afterwards from Jacob Pina, from whose manner 
the more are induced to think that Rembrandt drew his own in-
clination for powerful oppositions of light and shade; but 
whatever hints he may have obtained from others at the out-
let of his practice, they were soon lost in the cullage of 
his brilliant career, and absorbed in the laffre of his own 
over-powering abilities.

He was first brought into notice by having taken a pic-
ture to the Hague, and offered it for sale to an able connof-
isseur, who, conscious of his merit, treated him with kind-
ness, and gave him a hundred florins for it. By this incident 
both himself and the public were made acquainted with 
his worth; and hence arose the reputation and success he after-
wards enjoyed. Inclement occupation soon crowded upon 
him, and many pupils applied for admission into his school, 
with each of whom he received 100 florins a year; and 
whole copies of his pictures he net unfortunaty fold as ori-
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ginals, after allowing a short time upon them himself. By 
these means, aided by excellent industry, and the sale of 
etchings, which he produced with great facility and skill, 
he accumulated considerable wealth; his income, according to 
Sandraert, being, for a length of time, at least 2500 florins 
yearly.

His place of residence, during this successful display of 
his talents, was Amsterdam, where his peculiairies procured 
him the character of a humorist, whilst his abilities allure-
dafted and delighted his contemporaries, and he produced 
those works which still gratify succeeding ages.

The peculiarities of his mind are as much obeservable in the 
manner of producing his effects, as in the choice of the ma-
terials. The execution of his earlier works was in a flable 
highly labourd, with great neatnees, and patient comple-
tion of the figures; such is that of the picture of the woman 
taken in adultery at Mr. Angerlein's. As he advanced 
in art, he took liberties with the pencil, wrought with all 
the breadth of the brush, and left the touch undiffi-
turbed; he even employed the point, the pallet-knife, or his 
fingers, accordingly as they were most capable of producing 
the effect he desired, when seen at a proper distance, dis-
rregarding the appearance of the work upon a closer inspec-
tion.

In his pictures is exhibited a total inattention to the tale 
of the antique; he is even said to have made it a subjeet of 
rudicule, and to have jococly denominated a collection of 
old armour and rich dressies, which he had collected and 
employed to study and paint from, "his antiques." These he 
evidently used as his models, though frequently in most he-
rosmoneous combination; but by an innate power of feizing 
the most striking effects produced by light and shade, super-
added to the most perfect malkery over the materials of the 
pallet, he always excited an interest, either by originality or 
beauty.

It is not, however, the approval of his power in the tech-
nical part of the art, which can or ought to satisfy the ob-
server of the works of Rembrandt. Entering with the 
warth of a poet into the nature of his subjects, he produced 
pictures which terrify with their subility, delightful with 
their traftness, or gratify us with the most perfect tran-
scripts of Nature, in her most varied aspects. Being himself 
polluted of the full force of his subject, he impresses it 
strongly, and notwithstanding the frequent vulgarity, and 
even deformity of the agents he exhibits, he extorts from 
us praise before we have time to consider the means by 
which we are imdulated to bellow it. To him every time 
and fasion was alike easy of representation; and all degrees 
of illumination, in form or quantity, he managed with the 
greatest perfection; no matter whether the scene arose from 
the breadth of the noon-day blaze, the dimness of twilight,
the darkens of night, or the glimmerings of the lonely taper; whether the light were spread over an extended space and a multitude of figures, or confined to the interior of a room, and serving only to illuminate the books or the figure of a fequestered philosopher.

He was certainly a genius of the first class, although the objects upon which he exercised his powers bore little or no proportional value when compared with those selected by the best Greek and Italian masters. His invention was abundantly fertile, but employed generally among low characters and materials, although the subject he treated might be, as it frequently was, of a sacred or sublime quality. In designing the nude, he never appears to have had a thought of an elevated nature concerning form. Such as the model presented, he imitated with exactness, yet when he wished to be most perfect; but he sometimes seems to have forgot the idea of felection, by making figures demanding grace and beauty, such as Venus, Cupid, &c. still more vulgar, and in actions more disgusting, than those he drew of common life. The redemption of this vulgarity and meanness reeks with the extreme force, depth, richness, brilliancy, and truth of his colouring, and the perfection with which he treated his chiaro-oscuro; which conjointly fascinate the eye, and hold it in admiration, in spite of the deformities presented in design.

The power of Rembrandt in the art he practiced was perfectly original, and his exercise quite unlike that of any other painter; being drawn from nature with the most faithful and discriminating eye, but with the most peculiar selection. Always powerfully and beautifully executed, but not unequally too artificial; and only agreeable because it is perfectly effective. All imitations of his style which are not well wrought, reduce it to manner, and only exhibit the artifice by which it is conducted.

To guess from the number and fineness of his works, he must have painted with amazing facility. His systern appears to have been that of using the ground as a half tint, and repeating the lights and darks till he had obtained the effect he sought for. His pece, particularly in his earlier and more finished works, is remarkably delicate, yet full; and has never been exactly imitated; though some of his scholars, as Bohl and Eckhout, approached very near it; none of them, however, appear to have imbibed any large portion of his clear perception of natural effects, which to powerfully appeal to our sympathy in his scenes of twilight, of tempel, and the spirit-stirring gloom of night.

His pictures are subtly and highly valued, and are rarely to be purchased; and then only at very high prices. We are poffessed of many fine specimens of his talents, both in history and portraiture; and the gallery of the Louvre is rich in his smaller productions. At Florence also, and at Genoa, his name is esteemed, and his works preferred with due respect.

He lived to the age of sixty-eight, and died in 1674.

REMDA, in Geography, a town of Saxony, in the principality of Liénaich; 11 miles S.S.W. of Jena. N. lat. 50° 43'. E. long. 11° 10'.

REMEDIAL Part of a Law. See LAW.

REMEDIAL Statutes, are those which are made to supply such defects, and abridge such superfluities, in the common law, as arise either from the general imperfection of human laws, from change of time and circumstances, from the mistakes and unavowed determinations of unlearned judges, or from any other causes whatsoever. And this being done, either by enlarging the common law where it was too narrow and circumscribed, or by restraining it where it was too lax and luxuriant, hath occasioned another subordinate division of remedial acts of parliament into enlarging and restraining statutes. E. gr. in the case of treason, clipping the current coin of the kingdom was an offence not sufficiently guarded against by the common law; therefore it was thought expedient by statute 5 Eliz. cap. 11. to make it high treason, which it was not at the common law: so that this was an enlarging statute. At common law also spiritual corporations might leave out their estates for any term of years, till prevented by the statute 13 Eliz. cap. 10. This was, therefore, a restraining statute. Blackft. Com. book 1.

REMEDIOS, in Geography, a town of South America, in the province of Popayan; 71 miles S. of Santa Fe de Antioquia.

REMEDIOS, or Nostra Señora de los Remedios de Pueblo Nuevos, a town of Mexico, in the province of Veragua; 90 miles W.N.W. of St. Yago. N. lat. 8° 44'. W. long. 83° 16'.

REMEDIOS, or Payafal, a town of Mexico, in the province of Yucatan, in lake Pue. N. lat. 17° 3'. W. long. 91° 46'.

REMEDIOS, a town of New Navarre; 120 miles S. of Cafa Grande.

REMEDY, in Law, is the action or means given by law for the recovery of a right.

REMEDY, Remedies, in Medicine, any physical agent by which a disease may be alleviated or cured.

Remedies are either general or topical; the former comprehending such as influence the actions of the whole frame, as blood-letting from any large vein, the cold-bath, and almost all those medicaments or drugs which are taken into the stomach; the latter including those which are applied to, or in the vicinity of, any particular part which is diseased; thus, among topical remedies, are blood-letting by leeches or cupping, blisters, iíuse's, cataplasms, ointments, plasters, &c.

The operation of remedies is rather a question of experience than of logical investigation. Some remedies, the number of which appears to be very limited, posses a specific power of curing certain diseases. There are, perhaps, not more than two medicines, however, that are fairly entitled to the appellation of specificis: these are mercury, which cures the venereal disease, and sulphur, which cures the itch. The bark of cinchona has, indeed, been deemed a specific for intermittent fevers; but it is not entitled to such a character; and the eau medicinale, which has recently been brought forward as a specific for the gout, appears to have lost much of its reputation. The pretended specifics daily advertised for many diseases by quacks, are mere impostions, being commonly disguised forms of the most active and dangerous medicines which are employed cautiously by the faculty; such as sulphur, corrosive sublimate, and other preparations of mercury; laudanum, hemlock, and other narcotics. Of the former species are Ward's amulet, and his white drop; of the latter, are Dally's carminative, Godbold's balsam, and many others. The danger resulting from the use of these nostrums, arises from the indiscriminate administration of them in many diseases which have a similar name, but which vary much in different conditions, and at different periods of life. Much injury is done by the confant use of these pretended specifics, by the impudence which it contributes to maintain, that each disease has its specific remedy; whereas no opinion can be farther from the truth. When it is considered that almost every disease, though similar in name, arises from several causes (which we have already illustrated when speaking of cough), it will be obvious that the same remedies must be applied, upon general principles, to diseases of different name, and different remedies to those which have the
fame appellation; and that, therefore, the cure of diseases is not to be effected by applying a certain remedy to a certain disease nominally the fame, but only by first ascertaining the laws of the living body, and of its various organs, both in a state of health and of disease; in other words, the proper application of remedies can only be made by a thorough observation of diseases, after a previous study of the anatomy and physiology of the animal frame.

Remedies Appended. See Appendix.

Remedy for the Master of the Mint, in Coineage, denotes a certain allowance for deviation from the standard weight and fineness of coins. In some places the remedy is allowed in the weight, in others in the fineness; but mostly in both weight and fineness. It is considered generally as an allowance for the fallibility of workmanship; but in some foreign mints it is made a source of emolument: and when governments issue coins at a rate above their intrinsic value, the profit thus made is called "feignorage." Out of every fifteen pounds of gold coined at the mint in London (according to the account published by the learned Mr. Folkes, in his curious tables of English silver coins), some pieces are taken at random, and deposited in a strong box, called the pix; at certain intervals, sometimes of one year and sometimes of several years, the pix is opened at Westminster, in the presence of the lord chancellor, the lords commissiromers of the treasury, and others; portions taken from the pieces of each coinage are melted together, and a sallay made of the collective mints by a jury of the goldsmiths' company. At this trial the mint-master is held excusable, though the monies be either too safe, or too light; provided the imperfect and deficiency together are less than the sixtieth part of a carat, which amounts to forty grains of fine gold on the pound of standard, or the one hundred and thirty-second part of the value. It is said that this remedy is contained within narrow limits, as any workers can reasonably be superseded to make themselves answerable for. The remedy for silver coins is two pennyweights in the pound. If the deficiency or excess of the coin should be more than this, either in the weight, or in the fineness, or in both together, the money must be recoined at the expense of the master of the mint; and no allowance is made for remedy unless the error is supposed to have casually happened.

Reemee, in Geography, a town of Bengal; 16 miles S. of Koonda.

Remembrance, is the idea of something formerly known recurs again to the mind, without the operation of a like object on the external senso. See Memory, Reminiscence, and Recollection.

Remembrancers of the Exchequer, are two officers, or clerks, theren, formerly called clerks of the remembrance.

They are now distinguished by the apppellations of the king's remembrancer, and the lord treasurer's remembrancer. There is also another officer, called the remembrancer of first-fruits. Their business is to put the lord treasurer and judges of the court in remembrance of such things as are to be called upon, and dealt in for the king's benefit.

Remembrancer, The King's, enters into his office all recognizances taken here before the barons, for any of the king's debts; for appearance; or for observing orders; and makes out process against the collectors of customs, subsidies, excise, and other public payments, for their accounts. All informations upon penal statutes are entered in this office; and there all matters upon English bills in the exchequer chamber remain. He makes the bills of composition, upon penal laws; takes the statement of debts; has delivered into his office all manner of indentures, fines, and other evidences whatsoever that concern the affrual of any lands to the crown: he every year, in ergiino Antiquum, reads, in open court, the statute for election of sheriffs, and gives them their oath, and reads the oath of all the officers of the exchequer, where they are admitted.

Remembrancer, The Lord Treasurer's, is charged to make process against all sheriffs, escheators, receivers, and bailiffs, for their account; processes of fieri facias, extent for any debts due to the king, either in the pipe, or with the auditors; and processes for all such revenues as are due to the king, by reason of his tenures. He also makes record, by which it appears, whether sheriffs, or other accountants, pay their proctors due at Exeter and Michaelmas. He makes another record, whether sheriffs, or other accountants, keep their days of prestation: all eftreats or fines, fines, and amercements, fell in any of the courts of Westminster, or at the alizes or feissons, are certified into his office, and are by him delivered to the clerk of the eftreats to write processes upon them, &c.

Remembrancer of the First Fruits, he who takes all compositions and bonds for first fruits and tenths; and makes process against such as do not pay the same.

Remembrancer is also the title of an officer in the city of London, who is to attend the lord mayor on certain days, and whose business it is to remind his lordship of the select days, when he is to go abroad with the aldermen, &c. He is to attend daily at the parliament-house during the sessions, and to report to the lord mayor their transactions.

Remi, St., in Biography, archbishop of Rheims, who converted Clovis to Christianity, and baptized that monarch. He died about the year 535. There are some letters which pass under his name, but they are of a very doubtful authenticity. There was another saint of this name, or, as he is sometimes styled, Remigius, who was archbishop of Lyons, and presided in the council of Valentin in 855. He was a steady supporter of the doctrine of St. Augufine, on grace and predetermination, in several works that are now extant. He died in 875.

Remi, Joseph Hosmer, an advocate in the parliament of Paris, was born in 1738. At the age of eight he lost his sight, and it was believed irrecoverably, by the small-pox; but when he had attained the age of fourteen he was in the enjoyment of his eyes. He was author of a burlesque poem, entitled "Days," in opposition to Young's Night Thoughts; but his principal work is an eloquent oration in the chancellor de l'Hopital, which was crowned by the French academy in 1777, and censured by the Sorbonne. He also wrote the elegies of Molieres, Colbert, and Fenelon, and furnished the articles relating to jurisprudence for the French Encyclopaedia. He died in the year 1782.

Remi, of Auxerre. See Remigius.

Remi, Order of St., or of the Holy Vial, an order of knighthood in France, which, according to the most approved historians of that kingdom, was instituted by Clovis, king of France, in the year 499. The reigning king of France is always sovereign of this order, and the knights companions are never more than four; nor is it ever conferred on any person but the barons, Terrier, Bellel, Venelre, and Louverre, who file themselves baron knights of the Holy Vial, and are the heirs of the canopy under which the vial is carried from the abbey of St. Remi to the cathedral of Rheims, for the inauguration of the kings of France at their coronations. The badge of this order, which is worn pendant to a black ribbon, is a crois of gold, enamelled white, cantoned with four fleur-de-lis; on the crois,
crofs, a dove defcending, dipping its beak into a vial held in a hand, all proper."

REMICH, in Geography, a town of France, in the department of the Forez, and chief place of a canton, in the district of Luxembourg, feated on the Moselle; 12 miles E. of Luxembourg. The place contains 1480, and the canton 15,885 inhabitants, on a territory of 230 kilometres, in 15 communes.

REMIGES, in Ornithology, denote the primary and secondary wing-feathers.

REMIGIO, Fiorentino, in Biography, a man of letters in Italy, was a native of Florence. He entered at an early period into the Dominican order, and was called to Rome by pope Pius V. to superintend an edition of the works of St. Thomas. He was himself a confiderable author, and published "A Commentary on the whole Scriptures," translations of "Amianus Marcellinus," "Cornelius Nepos," and "Fazello's History of Sicily," "Reflections on Guicciardini's History," "Italian Poems," and "A Translation in Verse of Ovid's Heroic Epiftles," of which an elegant edition was printed at Paris in 1762. He died at Florence in 1586, about the age of 62. Moreri.

REMIGIUS. See Remi.

Remigius of Auxerre, a learned French Benedictine monk in the ninth century, derived his surname from the abbey of St. Germain, at Auxerre, where he embraced the religious profession. He distinguished himself by his proficiency in profane and sacred literature, at a dark and barbarous period, and was placed at the head of the schools belonging to his monastery. About the year 882, he was called to Rheims by Foulques, the successor of Hincmar in that see, who gave him the direction of the literary seminary which he had founded in his metropolitan city. Here he taught with great reputation for several years, after which he went to Paris, where he opened the first public school in that city, after the decline of learning which followed the ravages of the Normans. In the life of pope Formosus, by Platinus, the name of Remigius of Auxerre is the only one that occurs of a person eminent for learning under that pontificate. He was author of "Commentarius in omnes Davidis Psalmos," which was published at Cologne in 1539. It confines very much of the collected opinions and explanations of St. Ambrose, St. Augustine, and Cassiodorus, reduced into one mass. Another work of this author was entitled "Eucharist in posteriores XI. minores Propheta," published at Antwerp in the year 1545, with the "Commentaries" of Oecumenius upon the Acts of the Apostles, and their Epistles, and those of Arethas upon the book of Revelation; and "Expositio Mifha," deduced from the sentiments and authority of the fathers. Some critics have given, among the productions of Remigius, the "Commentary upon the Epistles of St. Paul," which by others has been ascribed to St. Remi, or Remigius, but which in truth are ascribed to belong to Haymo, a German bishop, who flourished in the ninth century, and who was author of a long line of theological works. Such at least is the opinion of Du Pin, in opposition, indeed, to the authority of Mohem. Moreri.

Remigius left behind him "A Commentary on the Musical Treatise of Martianus Capella," which is still subsisting among the MSS. in the king of France's library, No. 5304. He acquired his science from Heric. Heric was the disciple of Rabanus, and Hayman of Halberstadt, who had converted with the Roman fingers sent into France by pope Adrian.

REMI, in Geography, a town of France, in the department of the Ardennes; 7 miles W. of Charleville.

REMINISCENCE, Reminiscia, is that power of the human mind, by which it collects itself, or calls again to its remembrance such ideas or notions as it had really forgot: in which it differs from memory, which is a treading up of things in the mind, and keeping them there, without forgetting them.

Hence memory may be considered as a continual remembrance; and reminiscence as an interrupted memory.

How near akin ever the two faculties may seem, yet they are generally found separated; so that they who excel in one, are generally defective in the other.

The ancient Platonists were of opinion, that all learning and knowledge consisted in the reminiscence or recollection of notices which had been in the soul before its union with the body.

REMINISCERE, the second Sunday in Lent; anciently thus called from the first word of the introit of the mass said for that day, "Reminiscere multationum tuarum." See Recto.

REMIREA, in Botany, Aubl. Guian. 44. t. 16. Brown Prodr. Nov. Holl. v. t. 236. (See Miega.) We are acquainted with Mr. Brown's reasons for preferring the above name, whose origin does not appear, and which the classical Schreber rejected as barbarous.

REMIERMON, in Geography, a town of France, and principal place of a district, in the department of the Vosges; 10 miles S.S.E. of Epinal. The town contains 3250, and the canton 14,916 inhabitants, on a territory of 235 kilometres, in 15 communes. N. lat. 48° 1'; E. long. 6° 40'.

REMISIT. — Recto quando dominus Remisit. See Recto.

REMISSAM, in Geography. See Rema.

REMISSION, in Law, &c. denotes the pardon of a crime, or the giving up the punishment due to it.

REMISSION, in Medicine, is when a delirious abates, but does not go quite off, before it returns again: as is common in fevers which do not quite intermit. See Remittent.

REMISSION, Remissio, in Physics, the abatement of the power or efficacy of any quality. In opposition to the increafe of the fame, which is called its intention.

In all qualities capable of intention and remission, the intention decreases as the squares of the distance from the centre of the radiating quality increase.

REMISSION, Remissio, ascend., in the Ancient Music, was used to signify the palliation of the voice from acute to grave, being opposite to intention.

REMIT, in Commerce. To remit a sum of money, bill, or the like, is to send a sum of money, &c.

To remit is also used among bankers for what is accounted to be given a banker, or, as it were, discounted with him, for his giving a bill of exchange.

To remit is also to give up part of one's due to a debtor; as, I would remit you a fourth of what you owe on condition of paying me the reft in hand.

REMITTANCE, in Commerce, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

A remittance is properly a bill of exchange, or the like, sent to a correspondent, and the content of it to be received by him, or some other perfon, on whom it is drawn. By means of these remittances, large sums of money are returned from one city to another, without danger, without carriage, &c.
In London it is easy to get remittances upon any city in the world; in the country it is more difficult.

Remittances, Book of. See Book.

Remittance also denotes the due or fee allowed the banker or merchant, both on account of his trouble, and the different value of the species in the place where you pay the money, and where he remits it.

This remittance is more usually called change and exchange.

Remittance, in Medicine, implying also the word fever, is a fever which is characterized by a regular decrease and exacerbation of its symptoms every day, and differs from an intermitten, mulmhalt as the symptoms never disappear altogether, and the exacerbation is neither begun by the complete rigors, nor terminated by the profuse sweat, which occur in the latter. The remittent fever, however, originates, in common with the intermitent, from the influence of marsh effluvia, but under particular circumstances, which will be stated immediately.

It is scarcely necessary to describe minutely the symptoms of the remittent fever after the ample detail which we have given of those of fever in general (see Fever), and it varies extremely in its character, according to the season, climate, and other circumstances under which it appears. In its milder forms, the remittent begins with chilliness, latitude, pains in the bones, head-ache, and a disorders condition of the stomach, lots of appetite, hecticns, and even vomiting. At night the febile symptoms run high; the heat and thrill are great, the tongue and mouth are parched, the pain of the head is violent, the patient is totally unable to sleep, and is continually tossing and tumbling about, and often becomes delirious. But generally in the morning, an imperfect sweat brings on a remission of all the symptoms. In the evening, the paroxysm returns, but is not preceded by any cold fit or shivering; yet it is commonly more feverous than the former. Next morning it remits as before, and these periodical changes recur daily, becoming, however, less marked, if the disease be neglected, until the fever insensibly assumes a continued form. The pulse is full and quick during the exacerbations, and continues during the remittent to indicate fever; but rigors seldom precede the fits after the first attack. Many patients discharge a bilious matter from their stomachs by vomiting, and all are disordered in that organ. In the more violent forms, which take place in hotter seasons and climates, the disease often fevers the patient at once with a burning and violent head-ache, with little or no sensible chillines preceding it. The thirst and heat are intense, and acute pains in the back and all the limbs, with extreme latitude and inquietude, haras the patient, and nausea, vomiting, and pain of the stomach ensue. In some infinences, indeed, the head becomes so suddenly and violently affected, that a violent delirium, assuming the appearance of insanity, feizes the patient without any previous indication, until the remission evinces the nature of the disease. Many of the afflicted become yellow, as if affected with jaundice. Indeed, the remittent fever affumes every degree of violence, from the autumnal bilious fever of temperate climates, to the most severe yellow fever of tropical countries.

The circumstances under which these varieties of form occur, have been amply ascertained by experience. The combination of marsh effluvia and great heat are necessary to the production of these fevers; and they are violent, nearly in proportion to the degree of the latter. In cold climates, and in cool seasoons, as the spring, the mimaffa exicite but the common intermitent ague. But in the au-
tumnal season, especially when the heat is considerable, and the quantity of mimaffa great, as in the Low Countries, in particular years the production of these fevers is very extensive; they become actually endemic, and affect especially those persons who are not accustomed to the climate. The experience of all our military expeditions to Holland and Flanders, in the autumnal season, affords fatal proof of this truth. (See the writings of Sir John Pringle, Dr. Home, &c. on the Diseases of the Army in the Campaigns of 1742—1748, inclusive. And the fever epidemic of Waltheren, at a more recent period, cannot be forgotten.) In these climates, the remittent usually commences at the close of summer, in a milder form, and gradually assumes a more violent and formidable character, as the heats of au-
tumn advance. But if we extend our inquiries to the hotter regions of the globe, we find the disease under its most severe and fatal forms. In the south of Europe, especially in Spain, and those parts of the Mediterranean coasts where mimaffa are found, the autumnal remittent becomes a formidable malady in particular feasons; but we must proceed to the West Indies and America to discover the disease in its most terrific form; for although there may be a con-
tagious fever, which puts on the yellow or bilious character, Dr. Bancroft appears to have demonstrated, satisfactorily, that the yellow fever, commonly so called, is but the fever of the endemic remittent of the hot feasons of hot cli-
mates. (See his able " Essay on the Disease called Yellow Fever, &c." 1811) He affirms, indeed, that all fevers, oc-
curring in those countries in which the atmospheric heat rises, during certain feasons, to the 89th degree of Fahrenheit's thermometer, have a tendency to assume that violent and dangerous appearance, which is usually considered as characteristic of the yellow fever.

The testimony of all experienced medical observers con-
curs in proving the origin of remittent fevers from the in-
fluence of mimaffa. Thus, among the historians of diseafe, as it occurs among feamen in warm climates, Drs. Lind, Blane, Hunter, and others, have demonstrated the ex-
clusive attacks of these fevers to be among those men who have gone on shore, in swampy grounds, for water, &c.; and especially among those who spend the night on shore. Many instances are recorded, in which all the men so employed have been feized with fevers, while the rest of the ship's company have remained in health. (See Dr. Lind, on the Diseases incidental to Europeans in Hot Climates, p. 27. 221, &c. 5th edit. Dr. Blane, on the Diseases of Seamen, p. 92, and 392.) Again, Sir John Pringle, in his valuable work on the diseases of the army, has not only rated many facts which occurred under his own observa-
tion, but has adduced many proofs from the writings of an-
cient physicians and historians, in corroboration of the evi-
dence that these fevers have, every where, and at all times, originated in hot feasons, in circumstances where mimaffa existed. (Part 3. chap. iv. sec. 3.) In times, indeed, not very remote, when the want of proper means of carry-
ning off the filth and refuse of large towns by proper drains, and scavengers were not employed, and when the materials for the production of mimaffa were accumulated even in the streets, the remittent and intermitent fevers were ep-
emic, in favourable feasons, for the generation of the mim-
affa, and the source of contagious fatality. Thus, even in London, Dr. Short remarks that, early in the seventeenth century, "one of forty of the whole that died of fevers, died of agues." (See his New Observations, &c. on Bills of Mortality, p. 293.) And Burnet, in his History of the Reformation, says, that in the last year of queen Mary's reign, they "raged like a plague." At a later period, we have
have the testimony of Sydenham and Morton, in proof
of the great prevalence of remittents in London; and Morton
affirms that they were extremely destructive for several years
before the great plague, viz. from 1658 to 1664. He
states that Oliver Cromwell died of an attack of remittent
fever in the former of these years, and that he left his own
father, who was himself an experienced physician, from the
same disease, which had gone through his whole family.
(Morton, Pyreologista, append. ad Exerc. ii.) “The
result of the whole, therefore, is,” to use the words of Sir
John Pringle, “wherever the greatest causes of putrefaction
and putrefaction in the air exist, there also will be seen
the greatest number and the worst kinds of the remittent
and intermittent fevers.” This truth is farther confirmed by
the negative evidence, that these fevers have ceased to exist
where marshes have been drained, where towns have become clean,
when armies have moved to dry situations, and when the
heats of particular seas have ceased, or failed to occur.
What the nature of these maladies is, the investigations
of philosophers have not yet taught us. Dr. Bancroft has
entered at great length, and with great ability, into this
question, reasoning from a large collection of important
evidence. He details a number of interesting facts, which
seem to lead satisfactorily to the conclusion, that the Mere
exhalations from putrefying animal matter, however offensive
to the senses, are never productive of fevers. The fame
inference has been deduced, not less satisfactorily, by Dr.
Chirnholm, in a very elaborate and able dissertation upon
this topic, published in the Edinburgh Medical and Surgical
Journal for October, 1810, vol. vi. p. 389. However
counter to the general opinion, this doctrine, that mere
putrefaction is not the source of contagion and fever,
seems, indeed, by these writers to be established. The
experiment, in fact, has been tried on a large scale in France,
in the case of the prodigious exhumations made in the
church-yard of St. Éloi, at Dunkirk, in 1783; and in that
of the saints Innocents at Paris, in 1786. In the latter case,
more than 20,000 bodies were taken up, in every stage of putre-
cfaction, and a considerable part of the work was carried on
during the greatest heats of summer, rendering the whole
city offensive; yet no fever was occasioned by this immense
mass of corruption. (See M. Thouret's Memoir in the
Journal de Physique, for 1791, p. 253; and the Annales de
Chimie, vol. vii.) The good health of night-omen,
of persons living in dissecting-rooms, of those employed in the
manufactory near Bath of a sort of spermaceti from putre-
cifying flesh of all descriptions, and many other striking facts,
detailed by the two authors, just quoted, constitute a strong
evidence in proof of the absence of infallibility from mere
putrefaction.

Dr. Bancroft next proceeds to prove, by another ample
collection of facts and testimonies, that it is not the mere
aqueous vapour that constitutes the morbid quality of mar-
phims. The principal proofs that mere moisture is inac-
ceptable of producing these fevers, are, that sailors at sea
for many months are generally very healthy; that a great many
of men are more uniformly so than the Newfoundland
fishermen, who are usually enveloped in the dampett fog for several
months together; that while persons living on shore on un-
wholesome islands, as at Walcheren, are ipearedly attacked
with fevers, those who remain on ship-board, at a little dis-
tance from land, entirely escape them; and that the occur-
rence of these fevers has been frequently prevented by laying
swampy ground under water, under which circumstances the
moisture of the atmosphere must be highly augmented.

Considering, then, that the mineral part of the soil is not
vaporizable in any natural heat, and that animal substances
in a state of putrefaction are incapable of producing fever,
as well as the mere aqueous vapour, Dr. Bancroft was dis-
posed to conclude, that the morbid exhalations in question
arise wholly from the mutual decomposition of vegetable
matters and water; and that those swampy grounds are most
likely to emit them, which contain the largest pro-
portion of such matters, and in which the decomposition is
most rapid and complete. This conclusion, he is of opinion,
is confirmed by the facts that the exhalations from mac-
cerating hemp and flax are well known in Italy to produce
fevers, and that those arising from heaps of decaying indigo,
in the East and West Indies, have produced the same effects.
See his Essay on Yellow Fever, above quoted.

Of the Treatment of Remittent Fevers.”—The violence of
the symptoms, and consequently the actual character of these
diseases, vary materially in different seasons, climates,
and circumstances, under which they occur; so that no uniform
rule of treatment can be pursued for their cure. The same
remedies, indeed, which at one period of the same fever
are benefical, are hurtful if referred to at another. This
observation, however, is applicable to all febrile diseases,
and cannot be too often inculcated; since not only empiricism,
but the routine of too many of the pophysians, tends to the
appropriation of some leading remedy, whenever the name
of a particular fever is mentioned; with some it is bark,
with others antimony, and with others mercury; the indif-
criminat use of any of which must be necessarily productive
of injury.

In the more violent forms of the disease, which are
common in hot climates, and in which the attack is marked
by a sudden and severe affection of the head, with a hard,
full, and strong pulse, indicating, with other symptoms, an
inflammatory affection of the brain, perhaps the only re-
medy which is capable of arresting the disease, is speedy
and free blood-letting. In the most violent forms of all, this
evacuation should be resorted to very early, as within the
first twenty-four hours, or the mischief will have advanced
beyond the reach of this remedy. In milder cases, a mo-
derate bleeding from the temporal artery or jugular vein,
or even from the arm, within the first day or two, will often
remove the danger and severity of the fever. The re-
petition and extent of the bleedings must be determined by a
consideration of the violence of the symptoms, the duration
of the disease, and the vigour of the patient. The notion
that these fevers of hot climates are of a putrid nature,
caused they speedily run on to symptoms of debility, or pu-
trefcency, as they have been called, appear to be altogether
erroneous; and it is now generally admitted, that the only
effective mode of preventing these symptoms, is by arre-
sting the violent inflammatory excitation in the beginning,
of which they are the immediate effect.

The next most effectual remedy, if resorted to at all suf-
ficiently early, is purgation. The purgatives adminis-
tered should be such as in bulk and quality are not calculated to
offend the stomach, which is usually in an irritable state;
calamel, with jalap, answers the purpose well; and it is in
all probability by its purgative quality alone, that mercury
has been found benefical in these fevers. The efficacy of
mercurial purgatives, indeed, seems to have been fully esta-
dlished by the recent experience of our naval and military
practitioners, in every quarter of the globe; while the mer-
curial practice, which had for its object the excitation of salivation,
is shewn by Dr. Bancroft, from the testimony of Dr. Ruth
and others, its advocates, to have been by no means successful.

This early excitation is also considerably alleviated by
the application of cold in every mode. Almost all the mo-

REMITTENT.

dern writers bear their testimony to the important auxiliary operation of the cold and tepid affusion; although they admit that, alone, its effects are not sufficiently powerful or permanent to be depended upon. Coolness of the patient is to be promoted by every means; by the free use of cold aqueous drinks, by frequent washing, by the full admission of fresh air, and by the use of few and light coverings on the bed.

These remedies should be actively employed, and repeated on the return or non-cessation of the symptoms of excitement. For as an intelligent physician has remarked, "the great object is the removal of the local affection of the brain, or other organ, and the production of a complete remission of the febrile symptoms, in the least possible time, by which the dangerous symptoms of the latter stages are prevented or greatly mitigated, and a perfect and rapid recovery induced." (See Dr. Burnett's Account of the Bilious Remittent Fever in the Mediterranean, p. 22. Lond. 1814.)

This object is rather impeded, than assisted, by the administration of emetics and sudorifics; and altogether defeated by the use of bark, cordials, or stimulants of any kind, whether in the way of food or medicine. With respect to emetics, they are objectionable in all stages of the disease; for they not only fail in removing nauea, but actually increase that distressing symptom; their operation aggravates the affection of the head, of which the nauea appears to be sympathetic; and as the tendency of the disease is to augment irritability of the stomach, which often becomes extreme and distressing in the latter stages, so they contribute to aggravate this and other dangerous symptoms. Sudorifics are also to be condemned; for, in the first place, they are unnecessary, because a natural perspiration will readily ensue, as soon as the excess of heat above the standard of health has been removed, which can be accomplished with certainty by the proper application of cold water to the surface of the body; and, in the next place, the sudorifics which are used are apt to increase the irritability of the stomach; and if they fail to excite a diaphoresis, they increase the heat and the determination to the head, and tend to lengthen the paroxysm. With regard to the bark and cordials, they are invariably injurious in the first stage of the fever. When a distinct remission has taken place, some writers recommend the immediate administration of cinchona; but even these admit, that "if it be given when there is a parched skin, a hard pulse, a dry tongue, great heat and pain at the stomach, or delirium, it will generally be found to increase and prolong these symptoms." (See Bancroft, loc. cit. p. 76.) On the whole, however, the late experience in the Mediterranean led to the rejection of the use of bark, while any febrile symptoms whatever remained. "Under its use," says Dr. Burnett, "mortality has been great, relapse frequent, and (as in the cases of the Temeraire and Invincible) dysentery attacked nearly all the patients who had fever in a fever form; nor was there an instance, as far as I could learn, that, when given during a supposed remission of the symptoms, it prevented a return of the paroxysm. Too often it has been given with wine at the commencement of this disease, when the tongue has soon put on a brown, dry, and furred appearance; the anxiety, delirium, and irritability of the stomach, have been much increased; the whole train of nervous symptoms soon became formidable, refilling every means of alleviation, till death has put a period to the sufferings of the patient." Loc. cit. p. 34.

If any thing were wanting to corroborate the foregoing deductions from experience, in favour of the antiphlogistic and evacuant plan of treatment, in the commencement of remittent fevers, the detail of the appearances observed on dilution, after the death of patients in these fevers, would amply support them, by the proofs which it affords of the inflammatory condition of various organs of the body in these fatal cases. In different instances, investigated by Dr. Burnett and his colleagues in the Mediterranean, the vesicles of the brain were generally dilated, and in many cases completely gorged, with blood; the membranes of that organ were considerably inflamed, often presenting what that writer calls "a blood-shot appearance," and depositions of coagulable lymph were seen among the convolutions; there were occasionally also adhesions, and the ventricles were often dilated with a fluid, sometimes limpid, sometimes yellow. Appearances of high inflammation presented themselves in the cavity of the chest, affecting the lungs, pericardium, and diaphragm; and these were connected with depositions of lymph and effusions of serum. In the abdomen, the liver was generally found enlarged, and sometimes exhibiting marks of inflammation; the stomach dilated with air, and more or less inflamed, and containing a dark coloured matter; and the intestines in a similar condition, with frequent intus-susception.

These appearances, which are in fact the effect of the continuance of the febrile actions in the organs in question, sufficiently prove that the first stage of the disease, when active remedies, of an anti-inflammatory power, can be chiefly expected to produce a very decided removal of the disease. When the fever is a little more advanced, the principal object of the practitioner is to diminish the violence of any local affection that may be severe. Thus, if head-ache remains, with flushed countenance, suffocation of the eyes, and a firm pulse, a small bleeding from the temporal artery (the pulse being at the same time carefully examined) may be employed with advantage; a blister, applied to the head at this time, is also manifestly beneficial; and daily evacuations of the bowels should be procured by gentle laxatives, such as calomel oil, or glycerin, the powerful cathartics being now laid aside. Irritability of the stomach, which is often distressing at this period, is relieved by the effervescing draught, and by the application of leeches, or of a large blister to the pit of the stomach. A degree of furor sometimes supervenes, which is often removed by a blister applied to the neck or forehead, or by the application of leeches to the temples. If there is any obvious affection of the abdominal viscera, which should be carefully inquired into, blisters, and, above all, the warm bath, should be resorted to, as well as copious emollient glycerin.

If, however, from want of the means of relief, or from the violence of the disease, it has advanced to that stage, in which the yellow suffusion of the skin appears, and various nervous symptoms, subfultus, tremors, &c. come on, with increased uneasiness about the stomach, hiccup, or vomiting of a dark matter, resembling coffee grounds, with icteria, and a sinking or intermission of the pulse, little more can be done than to look on, and endeavour to obviate symptoms as they occur. "Singultus," to borrow again the words of Dr. Burnett, "is a dangerous, and commonly a most harrowing symptom at this time; it will often be relieved by camphorated julep, to which may be added opium and ather. If the pulse sink, the stimuli must be increased; and under these circumstances, I have found the carbonate of ammonia, with aromatic confection, of singular benefit. But while we endeavour to relieve the circulation, care must be taken not to induce a state of secondary excitement; and as the pulse rises, the stimuli should be decreased. Constant attention must still be paid to the daily evacuation of the bowels; but at a period, when the excitability of the sy-
tem is nearly destroyed, powerful cathartics will be attended with the most deleterious consequences: glitters are particularly serviceable at this time. As the disease advances, the secretions are at times voided involuntarily; in a few I have observed a retention of urine, and in these last cases the catheter should be used; but as a general symptom, there is far oftener a deficiency in the secretion of that fluid. Frequently in this state, the vomit rejects every thing. We may now safely indulge the patient moderately with any thing to which his fancy leads him. Bottle porter, wine, and brandy and water, have been found beneficial. But no remedy can be relied on with any degree of certainty: whatever calms the irritability of the stomach, and moderately supports the excitability of the system, is useful. A few spoonfuls of arrow-root or fago, with wine and spice, given occasionally, will often be retained by the patient, and greatly at this period assist the cure.” Burnett, loc. cit. p. 29.

During the state of convalescence at every period, whether from a complete remission being procured early, or from a gradual cessation of the disease, extreme caution is necessary in regard to preventing repletion: in the former case, it is apt to induce a relapse; and in the latter, it will retard the cure. During the whole progress of recovery, attention should be paid to the regularity of the bowels. Some light tonic, as an infusion of quassia, gentian, or cinchona, with an aromatic or pulmonic acid, may be administered. When the yellow suffusion of the skin has been great, a protracted convalescence is commonly the consequence: and often attended with irregular affections of the bowels, and symptoms of indigestion. In these cases, small doses of the mercurial pill, with an occasional gentle purgative of senna or rhubarb, are very beneficial. It is almost exclusively, indeed, in these protracted cases, where a morbid affection of the liver, brain, or some other visceræ, has been the result of the uninterrupted violence of the first stage of the fever, and especially when there is reason to suppose that affusion had taken place within the cranium, that mercury, in small doses, is of any actual utility. Small doses of calomel, or of the pilula hydragyri, should be administered until some sensible, but slight, effect be produced on the faecal visceræ; after which the disease often ceases of itself, or is readily removed by the use of the Peruvian bark. See Burnett on the Bilious Remitter in the Mediterranean; Bancroft on the Yellow Fever; and Irvine on the Diseases of Sicily. See also Fever, Yellow, and Miasma.

Remittent Fever of Children, the febris infantum remitteris of Dr. Butter, which is a very common affection of children, when the abdominal organs are deranged, has already been described at length, under the head of Infants, 9. 5. Febris Diferentia of; which see.

REMITTER, in Law. Where a man has two titles to land, and is seized by the latter; and, that proving defective, he is remitted or restored to the former more ancient title: this is called a remitter, from the Latin, remitteri, to send back.

If land descend to him that had right to it before, he shall be remitted to his better title, if he please. i Litt. 347. b. Litt. § 659.

Remitter is classed (with retainer) by judge Blackstone, among those remedies for private wrongs, which are effectuated by the mere operation of law, and is thus described: remitter is where he, who hath the true property or ius proprietatis in lands, but is out of possession thereof, and hath no right to enter, without recovering possession in an action, hath afterwards the freehold call upon him by some subsequent, and of course defective title: in this case, he is remitted, or sent back, by operation of law, to his ancient and more certain title. (Litt. § 659.) The right of entry, which he hath gained by a bad title, shall be ipso facto annexed to his own inherent good one; and his defeasible estate shall be utterly defeated and annulled, by the instantaneous act of law, without his participation or consent. (Co. Litt. 358. Cro. Jac. 409.) As if A defleases B, that is, turns him out of possession, and dies leaving a son C: whereby the estate descends to C, the son of A, and B is barred from entering thereon till he proves his right in an action: now, if afterwards C, the heir of the defierrer, makes a lease for life to D, with remainder to B the defierrer for life, and D dies; whereby the remainder accrues to B, the defierrer; who thus gaining a new freehold by virtue of the remainder, which is a bad title, is by act of law remitted, or in of his former and surer estate. (Finch. L. 194. Litt. § 683.) For he hath hereby gained a new right of possession, to which the law immediately annexes his ancient right of property.

If the frequent estate, or right of possession, be gained by a man’s own act or consent, as by immediate purchase being of full age, he shall not be remitted. For the taking such frequent estate was his own folly, and shall be looked upon as a waiver of his prior right. (Co. Litt. 348. 350.) Therefore it is to be observed, that to every remitter there are regularly these incidents: an ancient right, and a new defeasible estate of freehold, uniting in one and the same person; which defeasible estate must be offered upon the tenant, not gained by his own act or folly. The reason given by Littleton (§ 661.), why this remedy, which operates silently and by the mere act of law, was allowed, is somewhat similar to that given under the article Retainer; because otherwise he who hath right would be deprived of all remedy. For as he himself is the person in possession of the freehold, there is no other person against whom he can bring an action, to establish his prior right. And for this cause the law doth adjudge him in by remitter; that is, in such plight as if he had lawfully recovered the same land by suit. For, as lord Bacon observes (Elem. c. 9.), the benignity of the law is such, as when, to preserve the principles and grounds of law, it deprives a man of his remedy without his own fault, it will rather put him in a better degree and condition than in a worse. Nam quasi remedio defiliatur, ipfa re validet: si culpa aliquid. But there shall be no remitter to a right, for which the party has no remedy by action. (Co. Litt. 349.) As if the ifue in tail be barred by the line or warranty of his ancestor, and the freehold be afterwards called upon him; he shall not be remitted to his estate tail. (Moor. 115. 1 Ann. 286.) For the operation of the remitter is exactly the same, after the union of the two rights, as that of a real action would have been before it. As, therefore, the ifue in tail could not by any action have recovered his ancient estate, he shall not recover it by remitter.

The determination of the law, according to the doctrine of remitter above stated, might seem superfluous to an hasty observer; who perhaps would imagine, that since the tenant hath now both the right and also the possession, it little signifies what means such possession shall be said to be gained. But the wisdom of our ancient law determined nothing in vain. As the tenant’s possession was gained by a defective title, it was liable to be overturned by shewing that defect in a writ of entry; and then he must have been driven to his writ of right, to recover his just inheritance: which would have been doubly hard, because, during the time he was himself tenant, he could not establish his prior title by any possitory action. The law, therefore, remits him to his prior title, or puts him in the same condition as if
REMILINGEN, in Geography, a town of Germany, in the county of Wertheim; 9 miles E. of Wertheim.

REMNEY, or REMPSEY, a river of Wales, which rises in Brecknockshire, and, after separating the counties of Monmouth and Glamorgan, falls into the mouth of the Severn, a little below Cardiff.

REMOLADE, in the Manche. See CHARGE.

REMOLLAN, in Geography, a town of France, in the department of the Higher Alps, on the Durance; 13 miles S.W. of Embrun.

REMON, a township of Upper Canada, on the St. Lawrence; N. lat. 44° 50'.

REMONSTRANCE, an expostulation, or humble supplication, addressed to the king, or other superior, to beheve him to reflect on the inconveniences, or ill consequences of some order, edict, or the like.

Remonstrance is also used for an expostulatory counsel or advice; or a gentle and handesome reproof, made either in general or particular, to apprise or correct some fault.

Remonstrants, Remonstrants, a title given to the Arminians, by reason of the Remonstrance they made, in 1610, to the states of Holland, against the synod of Dort, in which they were condemned.

Episcopius and Grotius were at the head of the Remonstrants. And as the patrons of Calvinist pretended an address in opposition to their remonstrance, which they called their counter-remonstrance, they received, in consequence of this, the name of "Counter-remonstrants."

REMONTÉR, Fr., in Mufic, to new-string an instrument.

Remontoir, or Remontoire, in Horology, is a species of escapement, in which a secondary spring frequently wound up, or a small secondary weight frequently raised, by means of the maintaining power of a watch or clock, is substituted for the maintaining power itself; for the purpose of urging the balance or pendulum, at short intervals, by more equable impulses than can be constantly exerted by the maintaining power alone, as varied by different degrees of friction in the train. When treating of Escapements in general, under their appropriate head, we described three only out of the four classes, and reserved the fourth class, denominated Remontoir, till we arrived at our present article.

The first remontoir was invented and made by a German artist in 1600, according to Berthoud; but Huygens, who applied one to his marine clock, described it first in his "Horologium Oscillatorium," page 17, and, in conjunction with his cycloidal checks, it promised to be a great improvement in his machine; but, as no compensation had at that time been applied to the pendulum, and, as a pendulum is not calculated for a portable machine, particularly on the sea, the utility of the contrivance remained to be proved by subsequent artists. The contrivance under our consideration was a small weight, suspended by an endless well made metallic chain, that was coiled round the crown-wheel of the escapement, and wound up a small space, at every vibration of a half-second pendulum, by the next wheel, which wheel took its motion from the maintaining power, through the medium of the train, as is usual in common clocks; a ratchet and click, however, were a requisite appendage, to act in the way that the endless cord was applied, in winding up the maintaining power without stopping the motion of the works; such as we have already described in the fifth section of our article on Clock-work. One half of the weight of the remontoir actuated the escapement wheel during its small fall, and the other half was supported by the wheel that as often raised it again to its original height, while both parts of the folded chain were notched alike by the said weight. Leibnitz and Dr. Hooke also claimed the originality of a similar invention, but do not appear to have put it in practice, as Sully afterwards did.

Mr. Harrison and Mr. Mudge successively applied remontoir springs, instead of suspended weights, to the escapements of their time-pieces; but, as we have described these under our article Chronometer with sufficient minuteness, it is not necessary to repeat here what we have there detailed of their contrivances.

Mr. Cumming and Mr. Nichollon, on the contrary, had recourse again to weights instead of springs in their astronomical clocks; but as these weights did not act during the whole period of the vibration, we have already described them in another class, in the 21st and 34th sections of our Escapements.

After Huygens and Sully, who left no plans of their mechanism behind them for the advantage of future workmen, who had not access to the original machines, Gaudron contrived a remontoir, which performed its office very well, but which was applied in a wrong place, so as not to produce the desired effect of equalizing the impulses given to the regulator; for, instead of being applied to either the balance or balance-wheel, it was made to actuate the wheel preceding the minute-wheel; and, therefore, permitted the irregular friction of a considerable portion of the train to affect the motions of the balance, which fault was avoided in the construction of Harrison's and Mudge's time-keepers: the former of which had its secondary spring wound up eight times in every minute, and the latter had its two remontoir-springs alternately coiled at every corresponding oscillation.

Haley's.—In the year 1796, Mr. Charles Haley, of Wigmore-street, Cavendish-square, London, watch-maker, took out a patent for his invention of a new remontoir spring for a marine time-piece, or chronometer; the specification of which is contained in the 6th volume of the Repertory of Arts and Manufactures. Figs. 1 and 2, of Plate XLI. of Horology, exhibit, the first a perspective side view, and the second a plan of Mr. Haley's remontoir escapement, as originally drawn; and we propose to retain the same letters of reference as are inserted in the original description. The utility of the invention is rated to consist of its property of communicating an invariable force to the balance, which it does 150 times in the minute, in a train of 9000 beats in the hour. The same letters of reference apply to both figures, and indicate the corresponding parts, which will mutually illustrate each other. A B is the potence plate, and T the balance, the pivots of which, P, X, turn in the cock C and potence D; above the balance T is fixed a pendulum spring S, in the usual way; on the axis of the verge below the balance, are placed two small steel collets I and K, by friction, having each a ruby pallet projecting a little way beyond their surfaces. I is called the discharging pallet, and K the impelled one; which pallets, together with the pendulum spring, all vibrate with the balance, whenever it is put in motion. E is the balance-wheel of the usual form, moving just clear of the potence plate, and having its pivots supported by the cocks F and G. W V is the axis of the remontoir, which the inventor calls the remouning spring; and the three axes, or arbors, just described, stand in the straight line in the direction A B. Below the remontoir spring the round steel pallet M is fixed, so as
just to escape touching the ends of the balance-wheel's teeth in its resting position, and the notch cut in this pallet is to receive the impulse of any tooth of the said wheel that may, at any time, act against it, in pulling the line A B. 

Just above this large pallet is fixed, by friction, another smaller pallet N, of steel, in the form of a small-piece, and having impacted into it, near the centre of motion, and at right angles, a small ruby pallet, which points directly to the radial end of the notch cut in the large pallet M. A small collet, twisted fast to the axis of the remontoir, just above this small pallet, receives the lower end of the spring R, while the upper end is made fast to a piece in the cock H, near W, in a manner similar to that by which the pendulum-spring is fixed. On the arbor of the remontoir and under the plate A B, is twisted on a pallet K, which may be called the remontoir's impelling pallet, because it gives motion to the balance by striking the pallet K, which the author also called the impelling pallet; but is, as we have named it, more properly the impelled pallet, because it receives the impulse which pallet I imparts. From this detail of the pallets it is obvious, that whenever the balance-wheel impels the large pallet M, the remontoir-spring R, the small pallet N, together with its small ruby pallet and impelling pallet I, must have a contemporaneous motion, and will describe each its respective circle round the common arbor W V.

In fig. 1, o is a detent-spring, fixed by a screw and steady pin to the upper face of the potance plate, and pointing directly to the axis of the verge, which it nearly approaches. Its shape and mode of being fixed will be better understood from an inspection of fig. 3, which gives a side view of it, and from which it will be seen that it is placed high enough above the plate, to come in the way of the discharging pallet I, in each revolution of the latter. Upon the side of the said detent-spring o, next to the balance-wheel, a second, but very slender spring, is pinned, so that its projecting end exceeds that of the detent-spring, and comes nearer to the balance verge than that of the detent, as represented at m, in fig. 3. To the detent-spring is made fast a small ruby pallet p, seen also in fig. 3. The cock b is screwed to the potance, and the hole at f is tapped to receive the screw c, the head of which, being turned towards the centre of the small pallet N, forms a banking for the detent-spring a, when struck by the small-pallet. This screw, c, is removed from its due place in the drawing, to avoid confusion; and for a reason, which will presently appear, this double spring a may be called the remontoir-detent. On another side of the balance-wheel a second detent-spring d is fixed, pointing towards the centre of the remontoir axis, and forming nearly a right angle with the former detent: this second detent is adjudged by the screw y. The shape and situation of this second detent, which may be called the locking detent of the balance-wheel, is better seen in fig. 4, where its sapphire pallet s may be distinctly seen, against which the tooth 3 of the wheel is supposed to be resting in fig. 2. The situation of this pallet s, as adjusted by the screw y, determines the resting-places of the teeth 1 and 2, while they are equally free from the edge of the pallet M. The locking detent d is likewise made fast by a screw to the upper face of the potance plate; and the screw, f, placed in the cock e, but out of its place in the figure, forms a banking to the sapphire pallet s, while the screw g, in a smaller cock, limits the excursion of the detent-spring d itself.

Having described the various pieces of mechanism that compose this remontoir escapement, we will now proceed to explain its mode of acting. First, let us suppose all the parts at rest with the wheel locked by the pallet r last described, but that the wheel is ready to move in the direction of the arrow Z, by the action of the main-spring through the train, whenever the single detent d is by any force impelled back to its banking. Let it also be conceived that, when the small-pallet N is carried by any means in a direction contrary to that of the wheel till it reaches the pallet r of the remontoir or double detent-spring, the remontoir-spring is wound up by such motion, and size ver,j, and also that when the stroke of the small-pallet has driven back this detent to its banking, by striking the flopped face of the ruby pallet r, the detent will instantly return by the force of its elasticitv, and the back part of the said ruby pallet r will hold the small-pallet locked at its return, till the other impulse forces it forward; but that when the unlocking takes place, the spring of the remontoir, now wound up, returns by its own force to its original situation; and that its axis brings back with it its affixed pallets. Fig. 1 will be of no use in describing the manner of this escapement, but in fig. 2, the parts are represented in a plane ready to commence motion; the wheel is locked by tooth z against the sapphire pallet s of the single detent d, and the remontoir-spring is wound up, and kept locked by the small-pallet, resting behind the ruby pallet r of the double detent: in this situation let the balance be wound round in such direction that the discharging pallet t may strike the end of the double or remontoir detent outwards, taking both its springs along with it, and thereby unlocking the small-pallet; at this instant the remontoir-spring K begins to return, and brings all its four pallets with it, and during the return, pallet L, which we have called the impelling pallet, gives its stroke to pallet K on the verge, which we have called the impelled pallet, and through its medium to the balance itself, which now goes on in its oscillation, till the pendulum or balance-spring is wound up; in the mean time the little unlocking ruby pallet, impelled into the small-pallet near its centre of motion, meets with the extreme end of detent d, and drives it back to its banking, thereby setting the tooth 3 of the wheel free from the sapphire pallet s; the wheel being urged by the train, now proceeds till tooth 2 falls into the notch of pallet M, and is checked, experiencing a little recoil; the balance-spring, being now wound up, returns, and also the wheel winds up the remontoir-spring; till it is again locked, by the small-pallet, after its impulsion has driven back the detent: during this action the detent d returns by its own spring, and locks tooth 4 of the wheel, at the instant that tooth 2 escapes from the notch of pallet M, and the original situation of all the acting parts is now restored, except that the motion of the balance is not arrested, the slender spring fixed to detent a allowing it to pass in the return, without unlocking the sapphire detent; but when the backward oscillation is finished, and the balance returns, the same operation is repeated: i.e. the remontoir detent is unlocked, the pallets on its axis are brought back, the impulse is next given to pallet K of the balance, to restore its loss of momentum, and lastly, the wheel is unlocked to wind up the remontoir-spring as before.

The observation we have to make on this ingenious remontoir escapement is this, that on enquiry from good authority we learn, that the theory could never be completely put into practice by the inventor, though he laboured to obtain his object full fourteen years. However well the parts of action were mechanically made, the locking of the remontoir-spring was never certain, for the first given to the ruby pallet r by the small-pallet, drove back the detent so far, as frequently to enable the small-pallet to be brought back by the remontoir-spring, before the detent returned to catch it, the consequence of which was, that the pallets of the remontoir axis were all brought back, and the impulse vainly expended.

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perched by pallet L, before the pallet K of the balance returned to its place to receive it. Mr. Hardy, however, has lately contrived a species of locking that is quite certain, as well as safe, which we shall presently have occasion to describe.

Breguet.—We have not been able to ascertain the exact date of the French watchmaker Breguet's invention of a remontoir escapement, but as Berthoud has placed it after Haley’s in his "Histoire de la Méthode du Temps," we must conclude that it is of more recent origin. The mechanism is so complex, that the description given in the French work is divided into three parts, which plan we propose to follow. Figs. 5 and 6 of Plate XLII. of Horology, will suffice to explain the different parts of Breguet's remontoir; fig. 5, being a plan of the whole, and fig. 6, exhibiting a perspective view of such parts as could not be well understood without such representation. The first portion of the mechanism consists of two wheels of unequal numbers of teeth, with their planes in contact, and revolving on one common arbor concentrically, namely, the wheel B', and the wheel D, the first having many teeth and a larger diameter, and the second having few, for a reason which will appear hereafter. The teeth of these wheels are actuated by a pinion g, connected with the train, and having just so many leaves as there are teeth in the large wheel B', contained in the space between two contiguous teeth of the small wheel D. On the arbor of this pinion, near the pivot, is inserted a fly with unequal arms, represented by the letters i, b, in both figures, the longer arm of which, ba, is armed with a piece of steel of peculiar shape, seen in fig. 6. A spring-detent F, made fast to the cock at r, lies at right angles to the fly, when in a state of rest, and has a ruby pallet V at about one-third of its length from its interior end, which stops the fly by opposing its end b near a, and consequently prevents the train from urging the double wheel, so long as no force unlocks the pallet from the end of the fly; but if any impulse happen to bend the detent in a direction towards the pinion g, then the ruby pallet slips through a notch made in the fleete part of the fly, and the fly makes an entire revolution, while the pinion revolves and urges the large wheel the space of as many teeth as the pinion contains; that is, a space corresponding to the distance between two contiguous large teeth in the small wheel, which wheel also moves the same quantity, before the fly is again opposed and stops.

The second portion consists of the following parts; a spring G, curved at the interior, or moveable end, serves at the same time for a remontoir-spring, and also for a pallet to give the impulse to the balance; it has consequently a heel-piece e, by which it is urged into a state of tension by the small wheel D, at every revolution of the fly, and also a ruby pallet m, with a locking notch cut in it; a, H, made fast to a, is a detent-spring, placed nearly at right angles to the spring G, and having a flender spring N, made fast to its side; this detent-spring carries a small ruby A, which locks into the notch of the piece m in the spring G, when this is in a state of tension. Another ruby, inserted into the extreme end of the detent a H at s, is so placed, that the flender spring N can move from right to left without impediment, but when urged in an opposite direction against the ruby s, it takes the large or detent-spring along with it, and unlocks the remontoir-spring G, by removing the small ruby A from the notch of m. The detent-spring H has at its extreme end a claw, against which the ruby m falls when this detent escapes back from a tooth of wheel D; and this claw has a pin in it, against which the flender spring N rolls; again, at the extreme end of the flender spring N are fixed two parallel chamfered plates, so contrived, that any pressure made on the upper slope, or inclined edge, will depress the spring, but a similar pressure made on the under slope will elevate it again, the downward pressure being employed to disengage the ruby m from the claw, and the contrary.

The third portion consists of the pieces or pallets K and b, borne by the superior end of the verge of the balance, and fixed at a quarter of a circle from each other. When the oscillation of the balance is from right to left, or in the direction from k to K, the unlocking pallet piece K, in its motion, bends the flender spring, and pallets over it, but as the pallet b is placed above the plane of the wheel B', and under the spring H, this oscillation from right to left is performed in freedom, except that the flender spring N requires to be a little bent out of the way; but when the oscillation is made from left to right, the pin at H presses this flender spring against the ruby s, the spring H then gives way, and bending, allows the ruby p to escape from the notch at m, and the spring G, being unlocked, is at liberty to perform its office, which we now proceed to describe.

The action of these three portions of the mechanism may be thus explained: at the instant that the ruby p, in the detent a H, is disengaged from the notch at m in the remontoir-spring G, the pallet b of the balance is found pointing towards the common centre of the wheels, and ready to receive an impulse from the extreme end q of the curved part of the remontoir-spring G, which end now gives its stroke to the balance through the medium of pallet b; immediately after which stroke, the same end q proceeds till it falls on the end F of the fly's detent, to which it now gives a push, and remains quiet; this push unlocks the fly, as has been before explained, and an entire revolution is immediately performed by it, while its pinion g, now at liberty to advance, urges on the double wheel, till another tooth in the small wheel, catching the heel-piece n of the remontoir-spring, puts this spring again into a state of tension, and the ruby p, falling into the notch of m, locks it as before, the balance in the interim completing its oscillations: and in this manner the operation is repeated.

De Lafort.—In the year 1801, the Adelphi Society for the Encouragement of Arts, &c. rewarded Mr. John de Lafons with thirty guineas for his invention of a new remontoir watch escapement, which comes next under our notice. Figs. 1 and 2 of Plate XLIII. of Horology, are a plan and section of this escapement, as given by the inventor in the Society's Transactions of the year above-mentioned. In both these figures, A is the escapement wheel; B, the lever-pallet on an arbor with fine pivots, which has, at its lower end, the remontoir spiral spring C, fixed with a collar and fluted in the usual way; D is the pallet of the verge, having a roller turning in small pivots, for the lever-pallet to act against without friction; at e are the pallets for discharging the locking, with a roller between, containing a small notch; F is the arm of the locking pallets, continued at the other end beyond the centre of motion, to preserve the equipoise, and having flints and screws for adjustment of the banking; a and b are the locking pallets, being portions of circles fixed on an arbor, turning on fine pivots at the midway between the pallets; G is the triple fork, at the end of the arm of the locking pallets. In fig. 1, tooth 1 of the wheel having caught the interior end of the lever-pallet B, has urged it forwards and wound up the remontoir-spring, and the instant that the verge pallet D comes nearly in contact with the remote end of the lever-pallet, the discharging pallet E, taking one prong of the fork, removes the arm F, thereby relieving the tooth 3 from the convex part of the claw a, that locks the wheels. The
The wheel now advances a little way, just enough to allow the interior end of the lever-pallet to pass back again, as urged by the spiral spring, while the remote end of the fad lever gives an impulse to the balance, through the pallet D; the tooth 4 is then locked on the concave side of the locking claw b, and the interior end of the lever-pallet partly supports the following tooth; in this situation the oscillation is finished, and on the return of the balance pallet E, striking the proq of the fork in a contrary direction, again unlocks the wheel from claw b, while the force of this wheel is partly suspended by the end of the lever-pallet; being now at liberty, the wheel proceeds to wind up the remontoir-spring again, till another tooth falls on the claw a, now brought inwards, when the operation is completed, and the preflure of the inner end of the lever pallet against its contiguous tooth again relieves the claw a from a part of the preflure of the wheel, and thereby renders the unlocking as easy as before, when claw b was unlocked. This escapement appears to us an improvement on Haly's, both as to its simphcity and safety of locking, and the inventor proposes a full further simplification, by substituting a fright remontoir-spring for the spiral one, particularly in time-pieces intended to remain in a stationary situation, where the weight of the spring would form no objection; but it does not appear that such construction was ever adopted. The simplicity of the locking of the remontoir-spring by the wheel itself, where this spring and the maintaining power mutually re-act, requires, as might be foreseen, an unusually strong maintaining power, which is, perhaps, one of the great objections to this mode of applying the remontoir; unlefs, indeed, what was remarked by the society's committee be true, that the balance must vibrate in a large arc before the piece will continue to perform.

Maffey's.—Mr. Edward Maffey, of Hanley, in Staffordshire, received a reward of fifty guineas from the Adelphi Society, in the year 1803, for his invention of two different clock escapements, one of which we have already described, under our article Escapement, as being without a verge, and the other we shall make the subject of our present section. Fig. 3, of Plate XLII. represents so much of Maffey's remontoir escapement as is sufficient to explain all the essential parts; in which A is the swinging-wheel; B, C, are two detached pallets, moving on separate arbors, at opposite sides of the swinging-wheel; B is seen urged by the remontoir-spring E, by the aid of a tail-piece fixed on the arbor of pallet B, which receives the action; and the other pallet must be conceived to have a similar spring and tail-piece, which cannot easily be represented in the drawing; F is the verge bearing two arms without pallets, which press under the pins of the detached pallets, and raise them alternately, at each vibration of the pendulum, from the teeth of the swinging-wheel, which had been previously impelled by the maintaining power, and K is the pendulum suspended in the usual way, and having a crutch to communicate its force to the verge at the moment of withdrawing the pallets. All, therefore, that the pendulum has to do is, to disengage the pallets from the teeth of the swinging-wheel that locks against the inclined planes of the pallets; for the remontoir-spring then opposes the ascent of the pendulum, and aids its descent, by means of the connection between the pins of the pallets and the arms of the verge, which must, from the nature of the construction, continue in contact during a large portion of each excursion of the pendulum. It is not latted in the author's account (Trans. Adel. Soc. vol. xxi.) at what part of the arc of vibration the pendulum unlocks either of the pallets, but it seems to us capable of being made to effect this office at its point of greatest velocity, if it does not do that as now constructed. An attention to this particular is of the utmost importance in any escapement, since the natural law of gravity is the least deranged, when any force is given, or taken away, when the pendulum is at the lowest point of its arc, for the velocity it has at that point determines the height to which the ball shall rise; but any addition or diminution of the pendulum's momentum, beginning at any other point of the arc, either adds to, or diminishes the natural length of the vibration, and injures the isochronism. Besides, a spring commencing both its accelerating and retarding influence at the point of the pendulum's greatest velocity, acts, not only by a law commensurate with the law of gravity, but their various forces, thus exerted, are contemporary, and, therefore, act together as one; a consideration which never should be lost sight of in the construction of an escapement of any denomination. The principal advanges that the author seems to inftit on in this escapement, are, that the friction is diminished at the acting parts of the pallets, the impulse being given by a direct pulse, without, or with very little, sliding motion; and that a certain regular momentum is kept up in the pendulum, independently of any variation which may occur in the wheel-work, or in the acting part of the pallets during the short time of unlocking; but what is the principal object of such a contrivance, he has not stated, perhaps not considered, how this certain regular momentum is, or ought to be, modified. Indeed, in speaking of his other escapement without sockets, he says, that one of its advantages over this is, that during a part of the vibration the pendulum is digned; from which remark, it should seems, that he thinks the constant action of this remontoir-spring, however modified, an objection to be avoided.

Antis.—In vol. xxiii. of the Transactions of the Society last mentioned, it is stated, that Mr. John Antis of Fulneck, near Leeds, sent this society a model of a new clock escapement in 1805, with a corresponding description, for which a reward was voted him of twenty guineas. The model is deposited in the room at the Adelphi appropriated for the reception of models, but as the description is not published in the Transactions of the Society, nor an engraving of the model, we must infer, that the contrivance either is not new, or is not of such importance as to merit the particular notice that has been given by them to the inventors of like contrivances, who both preceded and followed him. Indeed, in the letters of Mr. Antis to the Society, published with their account of the rewards, it seems that two escapements were sent them, one a detached one, and the other, one that "would equalize the power of the impulse," which must, therefore, have been of the remontoir description; but he confesses that these contrivances by him "may have been practiced before." With respect to the latter escapement, he remarks, what is worthy of being recorded by clock-makers in general, that, by its means "a spring-clock will be as perfect as one which goes by weight, and more so if the latter has no remontoir." Should any of our readers have a wish to see and examine Mr. Antis' productions, which, he acknowledges, are done in a rough manner, and under disadvantageous circumstances, but which may not be the les ingenious on that account, there will be no difficulty in gaining admittance to the model room, where the original work is preserved with a view to public inspection, provided the applicant be properly introduced.

Mendham's.—It frequently happens that considerable improve-
improvements are made in mechanical contrivances, by men whose principal employment has no connection with the art to the improvement of which they contribute; this was probably the case with Mr. Antis, and is confessedly so with Mr. Mendham, who was rewarded with the silver medal of the Adelphi Society, in the year 1807, (see vol. xxi.) for his invention of a new clock escapement, in which an impelling (not however called a remontoir) spring acts, or professes to actuate, the pendulum at each alternate vibration. The account, particularly of the action, as printed in the society’s Transactions, seems to us so extraordinary, that we beg leave to transfer itverbatim, in order to make some remarks on it, that may enable the reader to judge of the escapement’s peculiar qualities, or at least of the manner in which they are described. Fig. 7, of Plate XI.II. already referred to, contains enough of this escapement to answer the purpose of the description in question, and therefore we will omit the references to fig. 1, in the original plate, and attend to its fig. 2, only. “Fig. (7) is a back view, which is supposed to be taken from behind the clock; A represents the axis of the swinging-wheel, or lathe wheel of the train of the clock; B is the swinging-wheel fixed upon it, having thirty ferrated teeth; it is turned round, in the direction from B to D, by the maintaining power of the clock; G is a spring-detent, which locks against one of the teeth of the swinging-wheel, and prevents its running down by the action of the maintaining power; H is another spring-detent, which is called the impelling spring; when left at liberty, it unlocks the former, by pushing against the end of the small arc, E, fastened to the detent G, and thus removing the end of the detent which obstructed the wheel’s motion; I is the rod of the pendulum, suspended by a cock ferreted to the back plate of the clock; a small piece of brass, A, projects at right angles from the impelling spring H, so as to intercept the pendulum-rod in its vibration, and at this place a small ferre is put through the pendulum-rod J, the point of which moves the impelling spring back: a small pin is fixed to the frame, in a line between the point of suspension of the pendulum, and the centre of the swinging-wheel, against which the impelling spring stops when at liberty.”

Supposing the pendulum to be vibrating backwards and forwards, and the wheel locked as in the figure, the pendulum swinging from M to N, the impelling spring H follows by its elasticity, until the pendulum J arrives at its perpendicular (or lowest point of its arc): at this period the impelling spring comes to rest against the end of the arc E, which it pulses back, so as to release the tooth of the wheel from the detent-spring G; the wheel now moves round a very small space before it meets the end of the impelling spring H, and is stopped thereby; in the mean time the pendulum continues its motion the extent of its vibration towards N, when it returns, and arriving at the perpendicular, it meets the impelling spring H, and carries it along with it, until the tooth of the wheel which rests against it escapes from the end of it, and another tooth of the wheel comes to rest against the spring-detent G. The succeeding vibration of the pendulum repeats the same operation.” This is the whole account, from which the reader is induced to believe that the pendulum, and impelling spring H, act and react on each other ad infinitum, without any aid from the maintaining power through the medium of the wheel, which is never laid to raife, or otherwise to move the impelling (or remontoir) pallet, in order that it may, in its turn, impel the pendulum by its acquired force. Again, it is said, the impelling spring unlocks the detent G when it arrives at the perpendicular, or nearly, if not quite, at the point of its quiescence, where it has no force; and from that point, not the
the wheel, but the pendulum unbars it into a state of ten-

tion, to resume its operation; that is, the pendulum raises

the spiral, that the spring may drive the pendulum back

again; and thus the vibrations are maintained without the

aid, and consequently without the necessity, of either a main-

taining power or train; and what is equally extraordinary,

the impelling spring locks the wheel by its resiliency, near

the perpendicular line (within the space of one tooth),

where it has almost the smallest force, or nearly the same

small force that it has when it unlocks the detent. Accord-

ing to this account, even supposing the action of the wheel

on the remontoir pallet to be omitted, the pendulum is under

the influence of the impelling pallet during nearly the whole

of one excursion, and free from it in the other. The model,

however, is said to be preferred in the society's room, and

will explain itself.

G. Prior's improved.—Mr. George Prior, jun. again pre-

sents an improved remontoir escapement for a clock to the

society we have repeatedly had occasion to name in this arti-

cle, in the year 1811 (vol. xxix.), and again receives a re-

ward at their hands, of twenty guineas, for his improvement.

The description given of this escapement, and of its ac-

tion, is sufficiently clear, and the alteration made in the con-

struction is in many respects an improvement, though we shall

take occasion to shew, in our remarks on it, that it is fully

liable to objections. In the plate last referred to, fig. 8.

contains the original fig. 1, which will explain the account

with sufficient precision. "The impelling wheel A," says the

author, "has thirty teeth cut in its periphery, and is con-

stantly urged forwards by the maintaining power; C, D, are

two spring-dets, catching the teeth of the wheel alter-

nately; these are, at the proper intervals, unlocked by the

parts marked 2 and 5 upon the pendulum-rod H, intercepting

small pins a, b, projecting from the detents, as it vi-

brates towards the one or the other; E is the renovating or

remontoir-spring, fixed to the same fluted, F, as the detents;

it is wound up by the highest tooth of the wheel, its posi-

tion, when unwound, being shown by the perpendicular dot-

ted line. This being the case, suppose a tooth of the wheel

called by the detent D, which prevents the wheel from mov-

ing any further, and keeps the renovating spring from

escaping off the point of the tooth; in this position the pen-

dulum is quite detached from the wheel: now if the pen-

dulum be caused to vibrate towards G, the part of it marked

2 comes against the pin b, projecting from the renovating

spring E, and pushes this spring from the point of the

wheel's tooth; on vibrating a little further, it removes the

detent D, which detains the wheel, by the part 3 striking

the pin a, which projects from the detent: the main-

taining power of the clock makes the wheel, thus unlocked, to

advance, until it is detained by a tooth reeling upon the end

of the detent C, on the opposite side; by this means the re-

novating spring will be clear of the tooth of the wheel as it

returns with the pendulum, and gives it an impulse by its

pin b pressing against the part 2 of the pendulum, until the

spring comes to the position shown by the dotted line, in

which position it is unwound, and rears against a pin fixed

in the cross-bar of the plate; the pendulum continues vib-

rating towards I, nearly to the extent of its vibration,

when the part 1 meets the pin in the detent C, and removes

it from the wheel and unlocks it; the maintaining power now

carries it forward, pushing the renovating spring E before it,

until another tooth is caught by the detent D, which de-

tains the wheel in the position first described." Agreeably

to this description, the pendulum is opposed in its ascent,

and accelerated in its descent, in one of its excursions from

the centre, or perpendicular line, by both the impelling spring

E, and detent D, after it is unlocked, though not the

whole distance; but is alternately accelerated and retarded

in the other excursions by the detent C alone, and only af-

ter the unlocking; these unequal checks, given at different

parts of the arc of vibration, we apprehend, are by no

means favourable to the natural isochronism of the pen-

dulum.

Hardy's.—Mr. Hardy, chronometer-maker, of Coppice-

row, Clerkenwell, London, whole ingenious improvements

in clock and watch-making have placed him high in public

estimation, on contemplating Mr. C. Haley's failure in

the locking of his remontoir detent, contrived a remedy

which fully answers its purpose, and which, on that ac-

count, merits our particular notice.

Fig. 7. of Plate XLI of Horology, represents the plan

of Hardy's new remontoir escapement, which, though it

appears to differ considerably in construction from Haley's,

yet refumbles it so much in its action, as well as principle,

that we will put the same letters of reference to the same

corresponding parts, in order that the reader who has per-

used our description of Haley's remontoir with attention,

may the more clearly comprehend our description of Hardy's,

and perceive in what the improvement consists. As in Ha-

ley's construction, T T represents the balance, or rather

the place of the balance not seen; E the escapement, or bal-

ance-wheel; P the pivot of the verge; S the balance-spring,

fixed as usual; K the impelled pallet or the unlocking

pallet of the remontoir; N the remontoir detent, or locking

pallet, on the same axis with a, the arm of the springer or

unlocking spring, which lies parallel with it; n the cock,

taking the pivot of the remontoir detent's arbor, and also

the upper end of its spiral spring; o the head of the banking

screw, and its fluted; H the cock that takes the pivot of the

remontoir, or cylindrical spring at W, and also one end of

the said spring, represented by the small circle at R; L is

the impelling lever or pallet, for giving motion to the pallet

K of the balance; M is a lever, instead of the notch in

Haley's large circular pallet, by means of which the wheel

winds up the spring R of the remontoir; O is a lever, in

place of the small ruby unlocking pallet of Haley, fixed to the

nail; i is the spring-detent of the wheel, and j its ruby, or

sapphire pallet, on which the wheel is locked, f and g being

the banking screw and its fluted, and y the place where it is

fixed by a screw on the potence plate; and lastly, the fac-

torial piece Q, in which the improvement chiefly consists, is

the addition introduced for rendering the locking of the

remontoir-spring, when wound up, both certain and secure.

The acting faces of the pallets, M, K, N, and of the cir-

cular portion of Q, are of ruby, or other precious stone

nicely polished, and are properly shaped for their respective

offices. From this description of the mechanism before us,

it will be perceived that the double spring s, and the detent

with a claw pallet at N, are both fast to the arbor of the

spiral spring, which gently presses the detent at all times

down upon the factorial piece Q, thereby prevent-

ing its being thrown back from its position for locking,

as was the case with Haley's remontoir detent. It will also

be seen that the arbor W, of the remontoir-spring R, has

the said factorial piece, the impelling lever L, the lever M

impelled by the wheel, and the discharging lever O; all fast
to it at different heights, the two first being above, and the

two last below, so that when one of these four pieces is moved

out of its first position by any external force, they all move

together, as do also the remontoir detent N and its spring

a on their common arbor, and as do likewise the pallets K

and I on the verge of the balance. These particular parts

being underfoot, and that levers in Hardy's construction are

used
uled for pallets in several instances, we may proceed to explain the action of the different parts, and to shew how they produce the desired effects of producing equable impulses on the balance at all times, and of effecting certain and secure locking of the remontoir-spring. In the figure before us, tooth 1 of the wheel has just proceeded far enough, by the action of the main-spring and train, to wind up the remontoir-spring, and its detent N, urged by its own spiral spring against the curved face of the sectorial piece, after sliding smoothly along it, has locked it; that is, by opposing it at right angles, prevents its return, which would take place when the wheel leaves the arm M, or, which is the same thing, when the remontoir-spring, on the same arbor with this arm, is wound up. The balance is now supped to have commenced its motion, carrying the pallets K and L outwards from the wheel, but the small pallet 1 has not yet arrived at the slender spring of the remontoir detent, though it is approaching it; the slender spring, however, soon yields to the outward impulse of this small pallet, without disturbing its arm or the detent N, therefore the remontoir-spring remains locked; at the return of the balance, which takes place when its spring is wound up, the said little pallet 1 displaces not only the slender spring but its arm also, which lies next towards the wheel, the one not being liable to move in this inward direction without the other; the consequence is, that the detent N is now lifted by its connection with the arm of the slender spring, and at that instant the remontoir-spring, being wound up, and at liberty to act, throws back the sectorial piece Q nearly its whole breadth, but not quite, for the claw of the detent in question rests on the curve of the sector during the motion we have described, till the unlocking lever O makes the end of the main-spring d, and forces the ruby pallet z out of the wheel, which wheel instantaneously takes its motion from the train, and meeting with lever M winds up the remontoir-spring a second time; in the meantime the impelling lever L has given its impulse to the pallet or lever K, and consequently to the balance, which has thus had its momentum increased; and on its returning vibration exactly the same process is repeated. Thus the force of the maintaining power is expended in winding up at each alternate oscillation the remontoir-spring, which spring, so reinforced, impels the balance in its turn by quantities of force that are always the same, whatever may be the irregularities of the force transmitted through the train that winds up the remontoir-spring; therefore, properly speaking, the remontoir-spring is the maintaining power that refires, at each alternate oscillation, the loss of momentum that the balance has experienced from the restraint of the air, and friction of the parts in action. This escapement is, notwithstanding, of the detached kind, leaving the balance performs the greatest part of its oscillations without any connection of even the auxiliary force derived at intervals from the remontoir-spring; and a chronometer of this construction, made by Hardy for his royal highness the duke of Sussex, answers the maker's most sanguine expectation, and will probably become a model for other makers when its merit is proved, and made public. The same artist has made several experiments on the same principle, with this difference, that the remontoir-spring is retained by the lever refilling on the tooth of the wheel, in place of being locked by the sectorial piece, as in the one before us.

Beside the preceding escapement, Hardy invented one for the astronomical clock he made for the Royal Observatory at Greenwich, which at first sight appears to resemble May's and Prior's improved one, with spring pallets, but on close examination we discovered that it has the following desirable properties peculiar to itself: 1st, it gives the impulse not only from remontoir-springs, but strikes and unlocks the two separate detents alternately, at the instant when the pendulum has the greatest velocity; and, 2dly, the accelerating and retardiing power imparted to the pendulum co-operates with the force of gravity, thereby deranging the natural law of gravity as little as possible. We feel not at liberty to enter more minutely into the description of this escapement, because we understand its inventor proposes giving an account of his machine himself, to be read before the Royal Society, as constituting the companion to Troughton's transit circle, already described by the astronomer royal. We have permission, however, to subjoin the rate of the clock in question for three quarters of a year, as taken at the Royal Observatory, which will afford the best proof of its pretensions to public notice. We have further to add, that the inventor has applied the same principle of movement to a chronometer of a large size, in which the balance has two metallic rods to adjust it for temperature, in place of the metal being flexed on the rim of the balance, as is common.

See Compensation.

Trial of Mr. Hardy's clock at the Royal Observatory at Greenwich in the year 1811.

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<thead>
<tr>
<th>Daily Rate</th>
<th>Mean of Thermometer</th>
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<td>April 12 to May 13</td>
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<td>May 13 to June 9</td>
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<td>June 17 to July 12</td>
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<td>December 10 to December 30</td>
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From the above stated authentic document it appears, that for the nine months of trial, and in opposite extremes of temperature, the daily rate never varied quite four-tenths of a second; and when the quantity of mercury proper for the compensation of the pendulum is exactly ascertained, it may be expected that the performance will be still more accurate; seeing that the deviation in the rate depends evidently on the change of temperature, and not on the escapement.

REMORA, in Natural History, the sucking-fish; a little fish, resembling a herring, called by the Greeks ebin, famous for flicking to the sides of ships. It belongs to the genus of ebin and clavi of thoracis in the Linnæan system.

Its characters, according to Arctedi and Linnaeus, are these: the branchiopetal membrane on each side contains about ten bones; the head is thick, depressed, naked, and marked on the upper side with transverse rough flria; the body is oblong, roundish, and naked, but somewhat compressed; the back-fin is oblong, and placed very far toward the tail; its under jaw is longer than its upper; it has a great number of teeth in both jaws; the colour of its body is hoary, and it has few fins; two pectoral ones, two ventral ones placed farther from the snout than the pectoral ones, one at the anus, one on the back, and one at the tail; the flria of the head are from eighteen to twenty-four in number, and they are rough and transverse, but are divided as they were into two series by a middle longitudinal line. By means of these flria or ridges the fish can fix itself to any animal
animal or other substancs, and has often been found adhering to the sides of ships and the bodies of sharks, &c.

Linnaeus enumerates two species of the echeneis; the remora and nezector: the former has a forked tail, and eighteen fiwes on the head; the latter has an entire tail, which is longer than that of the former, twenty-four fiwes, a larger body, and sharper fins. They are both inhabitants of the Indian Ocean. The remora is much talked of by the ancients, who, as we find from Pliny, lib. ix. cap. 25, lib. xxxi. cap. 91, unanimously believed it had the force to stop a vessel in full sail, or a whale in swimming; and hence called it remora, a remoraendo. (See Alian's Hist. de Animal. lib. ii. cap. 17. Plutarch. Sympol. lib. ii.) But Mr. Catenby observes, that even several of those fishes together can do no more than shells or corals, and other founnelles of the same hulk, which make a ship sail somewhat the greater. And in the fame manner only they make some fmall hindrance to a whale. The author laft mentioned affuues us he has taken five of them off the body of a hark. Vide Phil. Trans. No. 438. p. 113.

Remora, among Surgeons, is also an instrument used for fettng broken bones.

Remora Mutanus, in Natural History, a name given by some to the genus of shells called conchira venera, and porcellana. See Porceflain Shell.

Remotion, in Rhetoric, the fame with what is otherwise called metegeus.

Removal of the Poor. See Poor.

Remouelle, in Geography, a town of France, in the department of the Volges; 5 miles E. of Neufchateau.

Removing Obftructions to Tillage, the means of removing stones and any other obftructions that may be in the way of the plough.

The operations which are to be performed in these intentions are for certain different kinds, as the removing of various stones and flates of fony matters, both from above and below the surface of the lands; the eradicating and deftroying different kinds of woody materials of the tree, root, and plant forts, the taking away of the superabundant wetnefs; the deftruction of many aquatic vegetables, and fome others. See Land, Stone, Tillage, and Wood.

Remoulin, in the Manges, is used to denote a far upon a horfes fheat.

Remoulinis, in Geography, a town of France, in the department of the Gard, and chief place of a canton, in the district of Uzes; 7 miles S.E. of Uzes. The place contains 925, and the canton 4758 inhabitants, on a territory of 133 kilomètres, in 8 communes.

Remount, in War. To remount the cavalry, or dra¬goons, is to furnifh them with frefh horfes, in lieu of fuch as have been killed or disabled in the service.

Remphan, in Antiquity, the Egyptian name for the planet Saturn. Some think that remphan was the moon, others Mercury and Mars, and others the sun. See Chion.

Remply, in Heraldry, fomething filled up. The term is chiefly used to denote, that the chief is quite filled up with a fquare piece of another colour, leaving only a bor¬dure of the proper colour of the chief about the faid piece.

Remportéry, in Geography, a town of Hindoo¬ftan; 30 miles N. E. of Travancore.

Rems, a river of Wurttemberg, which runs into the Neckar, 4 miles N.W. of Waiblingen.

Remsa, or Remissam, a town of Saxony, in the lordship of Schonburg; 2 miles N.N.E. of Glauchau.

Remscheldt, a town of the duchy of Berg; 2 miles S.W. of Lennep.

Remsen, a township of America, in Oneida county, New York, E. of Leyden and adjoining it.

Remungol, a town of France, in the department of the Morbihan; 7 miles S. of Pontivy.

Remuria, among the Romans, a festival instituted in honour of Remus by his brother Romulus. See Lemuria.

Remuzal, in Geography, a town of France, in the department of the Drôme, and chief place of a canton, in the district of Nyons; 6 miles N.E. of Nyons. The place contains 51, and the canton 3724 inhabitants, on a terri¬tory of 2724 kilomètres, in 17 communes.

Remy, a town of France, in the department of the Oise; 6 miles N. of Clermont.

Ren, a town of Russia, in the government of Novgorod; 16 miles S.E. of Uflinzua.

Renaçon, a town of France, in the department of the Rhône and Loire; 6 miles W. of Roanne.

Renaix, a town of France, in the department of the Scheldt, and chief place of a canton, in the district of Audenaerde. The place contains 9499, and the canton 14,683 inhabitants, on a territory of 70 kilomètres, in 6 communes.

Renalis, Renal, in Anatomy, an epithet applied to the parts belonging to the kidney; as to the artery and vein of the organ, also called renal, of which the former comes from the aorta, the latter joins the inferior vena cava; see Artery and Vein: to the plexus of nerves derived principally from the ganglia of the great sympathetic; see Nerve; and to the small bodies placed above the kidneys, called the renal capsules. See also Kidney.

Renalis Lapis, in Natural History, the name given by many authors to a fort of fiderochitum, or crufiatted ferruginous body of that kind, containing a nucleus of a different matter from that of the crufs. It is found about Prague, and in fome other places, lying near the surface in frata of a yellow clay. Its usual bignefs is that of a ripe peach, and its crufs are of a dusky ferruginous brown colour; and its internal nucleus of a pale yellow-green, com¬posed of a marl sheet, and usually of a kidney-like shape, whence its name.

Renaubau, in Geography, a town of Hindooftan, in Dowlatabad; 114 miles N.W. of Hydrabad. N. lat. 18° 53'. E. long. 79° 10'.

Renathia, a town of Afiaic Turkey, in Car¬mania; 10 miles S.W. of Satalia.

Renan d'Elisagaray, Bernard, in Biography, a dif¬tinguished engineer and naval architect, was born in the province of Bearn, in the year 1672. He was at an early age intrefted in the mathematical sciences, and was obferved not to read a great deal, but to think moff profoundly, and as he advanced in years, he was capable of thinking upon the moft abftrufe subjects, as well in the midft of things, as in the clofet. One of the first books that attracted his attention was Malebranche's "Recherche de la Verite;" and, if he did, it made such an impression upon him, that nothing could efface it through the whole of his life. It gave him a full conviction of the truths of religion, and preferred his morals pure and uncorrupted. In 1679 he was placed with the count de Vermandois, admiral of France, as his inftigator in naval affairs. When, by the royal command, conferences were held to determine upon a plan for bringing to perfection the construction of veffels, Renan was called upon for his opinion; and at length the eftates of Du Quefne and that of Renan were alone left for confideration, and to the honour of Renan, then young and almost unknown, his plan was adopted, and he himself was sent to Breit and the other ports to put it in execution.
In 1680, the Algerines having declared war against France, Renau proposed the bombardment of Algiers, for which purpose he conceived the idea of bomb-vessels, which were as yet unknown. This was at first regarded as visionary; but reliance being placed on his talents, he was permitted to make the trial, and he brought five of these vessels before the town, where, under the command of Du Queule, the bombardment was executed with complete success. In 1684 he was employed, as engineer, at the bombardment of Genoa; from this place he went to join Vauban, who was fortifying the frontiers of Flanders and Germany, and he contracted an intimate friendship with that great man. In 1688 he accompanied Vauban to the siege of Philipburg, and afterwards conducted, or was present at some other sieges; yet in the midst of these active services he found leisure to attend to his studies, and published in 1689 his "Theorie de la Manoeuvre des Vaiffayes;" some of the propositions in this work were contested by the celebrated Huygens. In this same year he endeavoured to prove, by argument, that the navy of France might be rendered capable of making head against that of England and Holland united, and his observation produced such an effect upon the government, that an order was made to change all the 50 and 60-gun vessels, on the fleets, into ships of a higher rate. About the same time he invented a new series of naval evolutions, signals, and orders of battle. His merits were well understood by the government, who rewarded him with a pension, and considerable rank in the service. He was now sent to Brittany for the purpose of instructing the naval officers in his newly invented evolutions, &c. He met with an opposition, which is not uncommon in endeavouring to change old established customs. Of his opponents, two of the most distinguished were put under arrest and broke, though he did his utmost to prevent the punishment being carried to that extreme. He afterwards served under Vauban at the siege of Namur, from thence he repaired to St. Malo after the battle of La Hogue, to save the relics of the French fleet which had taken shelter there. Having constructed a vessel of 54 guns upon his own plan, Renau put to sea with the view of intercepting two rich English East Indiamen, one of which he captured after a desperate engagement. Among the booty were some packets of diamonds, which he thought of too great value to be claimed by himself, though the naval customs would have justified him in it, and he carried them to the king, who accepted the prize, and remunerated the captor with an annuity. When Philip V. succeeded to the crown of Spain, he sent to his grandfather, Lewis XIV., to request that he might have Renau to direct his engineers in fortifying his most important towns. He found means to render the crown of Spain the most important services, and was, in 1704, employed in the siege of Gibraltar, which, it has been affirmed by the French biographer, was about to surrender, when it was relieved by the English fleet. To the disgrace of the court of Spain, whose interests he had effectually promoted, and in whosecause he had expended his own property, he was suffered to return to France with a single pilote in his pocket, though his Catholic majesty had given him the title of lieutenant-general of the armies of Spain. The high reputation which Renau had acquired as an engineer, cajoled the grand-master of Malta to request that he might be sent to that island on an alarm of an invasion, which was readily granted. Soon after this Lewis XIV. died, and the duke of Orleans ascended the regency, who appointed Renan to be counsellor of the marine council, and grand-croix of St. Louis. He died of a dropsy in 1719, and his death was, like that of La Trappe, in ardent aspirations after another life: "What a difference," he exclaimed, "from one moment to the following! I am going to pass in an instant from the thickets of darkness to perfect light." He had been twenty years an honorary member of the Academy of Sciences, and was among the first after that elss was instituted.

RENAUDOT, EUSEBIUS, a learned writer on the ecclesiastical history and antiquities of the Eastern church, was born at Paris in 1646. He was educated at the Jesuits' college, and entered the congregation of the oratory when he was about 19 years of age, though he had no intention of entering into holy orders, or to the taking any ecclesiastical degree. He was particularly attached to the study of the oriental languages, in the knowledge of which he far excelled almost all his contemporaries; and he applied with success to the study of so many other tongues, that he was sufficiently master of seventeen different languages, to be able to speak the greater number of them with facility. He became well known at court, where his genius, his talents, and his politeness, made him much esteemed and admired. Here he was noticed by M. Colbert, who was desirous of establishing printing-presses for the oriental languages at Paris, and consulted Renaudot upon the subject, as a person who might ably contribute to render such an establishment useful to the state as well as the church. To engage his affianced, he promised him the reversion of the pole of keeper of the king's library; but the minister died before the place became vacant. He received a similar promise from the archbishop of Rheims, and was again disappointed. He was, however, employed by the king in various confidential concerns of great importance relating to the affairs of Rome, England, Spain, &c. So much was his time occupied by these engagements, that he almost entirely discontinued his favourite studies. In the year 1689 he was received into the French Academy, and in 1692 into the Academy of Inscriptions and Belles Lettres. He found a patron in the cardinal de Noailles, archbishop of Paris, whom he accompanied to Rome in the year 1700, and into the couclave which elected Clement XI. to the papal dignity. While he remained in that city, the collections of the Vatican furnished him with new matter relating to the oriental churches, and revived an intention, which he had long before encouraged, of preparing for publication some pieces which serve to illustrate their history and opinions. In this design he was assisted by the new pope, who perfused him to remain in Rome several months after the departure of cardinal de Noailles. His holiness would gladly have conferred upon him some valuable benefices, but he refused to accept of anything beyond a small priory. The abbe Renaudot afterwards went to Florence, where he met with most flattering reception from the grand duke, who assigned him apartments in his own palace, loaded him with presents, and on his departure directed that he should be conveyed on board one of his own vessels to Marseille. At Florence, likewise, he was made a member of the Academy de la Cruela. Soon after his return from France, he was routed by an attack upon father Nicole's "Perpetuity of the Faith of the Catholic Church respecting the Eucharist," and in 1708 he published "A Defence of the Perpetuity of the Faith against the Calumnies, &c." He afterwards entered more fully into the subject which he defended, and displayed all his erudition and ingenuity in endeavouring to show the conformity between the doctrine of the Greeks, and all the oriental Christians, with that of the Latin church. What he wrote upon the subject extended to two vols. 4to. which were published in 1711 and 1713, by way
of supplement to father Nicole's work. During the regency of the duke of Orleans he made frequent efforts to obtain his encouragement of the plan for establishing printing-presses for the oriental tongues, and was promised, but never obtained effectual support. The latter years of his life he spent in completing numerous very learned and important publications, among which may be mentioned, "Vitia Patriarcharum Alexandrinorum Jacobitarum;" "Botaniarum Orientalium Collectio," in 2 vols., accompanied with very learned dissertations: "Ancient Accounts of India and China, by two Mahometan Travellers in the 9th Century, translated from the Arabic." Renaudot died in the year 1720, at the age of 74 years, greatly regretted by the literati of that age, to whom he was a communicative and most agreeable companion, and lamented by the poor, to whose relief he had dedicated a large portion of his income.

RENAY, or RONSE, in Geography, a town of France, in the department of the Jemappe, with a magnificent chateau; 7 miles S. of Ouendearne.

RENCHEH, a town of the duchy of Baden; 4 miles N.N.W. of Oberkirch. - Alfo, a river of Baden, which rises in the Ortau, and runs into the Rhine, 10 miles N. of Oberkirch.

RENCOUNTER, formed from the French, rencontre, meaning, in the Military Art, the encounter of two little bodies or parties of forces.

In which sense, rencounter is used in opposition to a pitched battle.

RENCOUNTER, in single combats, is used by way of contradiliction to duel.

When two persons fall out, and fight on the spot, without having premeditated the combat, it is called a rencounter.

RENCOUTRE, or RENCONTRE, in Heraldry, is applied to animals when they flew the head in front, with both eyes, &c. or when the face stands right forward, as if they came to meet the perfor before them.

Indeed, in deer, this is called *muse*; and, in the leoparid, it is the natural situation. He bears fable in rencontre, a golden fleece.

RENDE, in Geography, a town of Naples, in Calabria Citra; 5 miles N.N.W. of Cofenza.

RENDER, in Law, a term used in levy ing a fine. A fine with render, is that by which something is rendered back again by the cognizee to the cognizor.

The lawyers also say, there are certain things in a manor, which lie in render, i.e. which may be taken by the lord, or his officers, when they please, without the tenant's leave; and others which lie in render, that is, must be rendered or answerable by the tenant, as rents, reliefs, heriots, and other services. See PRENDER.

Some service consists in seffance, some in render.

RENDERING, in Building. See Pargeting.

RENDERING, in Sea Languages, is generally understood to be the effect of yielding or giving way, without refutation, to the efforts of some mechanical power. It is usuall expreèd of a complicated tackle, lanierid or lashing, when the effect of the power applied is communicated with facility to all the parts, without being interrupted in its passage. It is therefore used in contradiliction to jamming.

RENEALMIA, in Botany, a new genus of Mr. Brown's, has lately received that name from him, in juft commemoration of Paul Renealmia, or Renualle, a physician at Blois, who published, in 1611, a thin quarto volume at Paris, entitled *Specimen Hyloae Plantarum,* with expressive, but stiff, and not neatly finifhed, engravings in copper, in which each plant is distinguished by an appropriate Greek name, moftly of the author's invention. Mr. Brown observe, that this author was the firft who paid attention to the differences in the number, situation, and proportion of the flaments. Linnaeus, in his own copy of the work, has expreffed a well-founded surprize, at its being never quoted by the Bauhins. Plumier was the author of the firft Renealmia, now funk in the Linnaean *Tillandia.* Linnaeus, or his fon, dedicated a monandrous genus, in the Supplementum Plantarum, to the memory of this meritorious botanist; but it proved not distinct from a more generally-received genus, of the fame date, *Alpinia.* We with the present Renealmia may be found sufficiently different from *Sifirhcinum,* to which its species were originally referred by its learned author.—Brown Prodr. Nov. Holl. v. 1. addend. (Sifirhcinum; ibid. 304.)—Clara and order, *Monadelphus Triandra.* Nat. Ord. Enfates, Libn. Iridae, Jull. Brown.


The species are herbaceous, smooth, inhabitants of woods. *Roots fibrous, sometimes tuberous. Leaves glabrous, laciniate.* Ribbed. Stem roundish, sometimes divided. *Flowers in alternate umbellate bunches, with short permanent theses.* *Corolla regular, white, spreading, soon falling off; the outer petals generally greenish at the back; the inner often furnished with claws. Filaments either combined below, or distinct; their upper part spreading. Capsule membranous. Seeds in two rows, black.

1. R. paniculata. Panicled Renealmia. Brown n. 1. — Stem panicled. Leaves ribbed; roughish at the edge. Outer 4 R petals pointed by the general, where all the troops that compose the army are to meet at the appointed time, in face of an alarm; and the regiments have their particular rendezvous, called their quarters of assembly.

In a naval sense, it denotes the port or place of destination, where the several ships of a fleet, or squadron, are appointed to rejoin the whole, in case of a separation, occasioned by tempestuous weather, or other unforeseen accident.

RENDEZVOUS, in Geography, a bay on the S. coast of Antigua, W. of Falmouth harbour.

RENDEZVOUS, *Island of,* an island, or rock, in the southern Indian ocean, discovered in 1773 by M. de Kerguenen, near the N. coast of Kerguenen's land, and called by captain Cook "Bligh's Night-cap."

RENDEZVOUS, *Key,* a small island in the bay of Honduras, near the coast of Mexico. N. lat. 16° 59' W. long. 88° 40'.

RENDIS, in a Ship, are the same as the seams between her planks.

RENDSBORG, in Geography, a town of Germany, in the duchy of Holstein, seated on a canal which communicates with the Baltic, on the borders of Slefwick, supposed to be one of the strongest towns in the Danish dominions, and generally well garrisoned. The number of inhabitants is about 3000; 15 miles W. of Kiel. N. lat. 54° 22'. E. 9° 52'.

RENE, a town of France, in the department of the Sarthe; 15 miles N. of Le Mans.
petals linear-lanceolate; inner scarcely twice as large, oblong-oblong. Filaments united half way up.—Gathered by Mr. Brown, near Port Jackson, New South Wales. The leaves are all from ten to eighteen inches long, and for the most part rough-edged.

2. *R. grandiflora.* Large-flowered Renelia. Brown, under the former.—Stem panicled. Leaves ribbed; roughish at the edge. Inner petals four times as large as the outer. Filaments united half way up.—Gathered by the Rt. Hon. Sir Joseph Banks, in New Zealand. Akin to the former, but differing in the proportion of its inner petals, which are four or five times the size of the outer.

3. *R. pulchella.* Elegant Small Renelia. Brown n. 2.—Stem nearly simple. Leaves with smooth edges. Outer petals oval-oblong; inner obovate, with short claws. Filaments distinct.—Gathered by Mr. Brown near Port Jackson. The leaves are only three or four inches long.

RENEE DE FRANCE, in Biography, duchess of Ferrara, born at Bilois in 1510, was daughter of Lewis XII. and Anne of Brittany. She was affianced, when very young, to Charles of Austria, afterwards emperor, and some years after was engaged in marriage by Henry VIII. of England, but neither of these matches took place, and Francis I. gave her to Hercules II. of Este, duke of Ferrara. This princess is celebrated for her talents: she had a great capacity, and an indefatigable thirst for knowledge, and her studies were not limited to history, the languages, and mathematics, but embraced various other topics, especially astrology and theology. The religious controversies of the time greatly interested her, and she became zealously attached to the tenets of the reformers; her court at Ferrara became the refuge of all who were suspected of heresy, and her conduct gave so much offence to the court of France, that Henry II. sent a doctor to the duke with the following instructions: "If the duchess perfils in her errors, she must be separated from all conversation; her children must be taken from her, and all her domestics who are suspected of heresy, and who are to be prosecuted; with regard to the princesse herself, the king refers to the prudence of her husband to proceed against her as he shall judge proper, avoiding, nevertheless, what might occasion too much scandal." After the death of the duke, in the year 1559, this princess returned to France, and resided at her castle of Montargis. In the religious wars the duke of Guise summoned her to deliver up some partizans who had taken shelter with her, she replied, "I will never deliver up those who look to me for protection; and if you attack the castle, I will be the first to appear in the breach, to see if you will have the audacity to kill a king's daughter." She was, however, at length obliged, much against her will, to send away 400 persons, to whom she had afforded an asylum. She parted with them in tears, after providing for the expenses of their journey. At the massacre of St. Bartholomew she was the means of saving the lives of a great number of Protestants. Her four children were taken successively from her, and brought into France, to be educated in the principles of the Catholic church. She died at Montargis, in the year 1575. Morel.

RENAGADO REEF, in Geography, a rocky islet in the bay of Honduras, near the coast of Mexico. N. lat. 16° 10'. W. long. 88° 50'.

RENAGATE, RENAGADO, a person who has apostatized, or renounced the Christian faith, to embrace some other religion, particularly Mahometanism. They are the renegados who prove the most barbarous to the Christians when they fall into their hands. The rene-gate is thus called, *quafi re-nerat Christiun.*—Hoveden men-

tions this in the year 1192, under the name of *renier,* from the French, *renier,* to deny again.

RENDLE, in Geography, a river of France, which runs into the Seine near Rouen.

RENDLING CURD, in Rural Economy, a term used provincially to signify the broken curd in cheese-making. See Cheese and Dairying.

RENE, in Anatomy, the Latin name for the kidney. See Kidney.

RENE SUCENTURINITI, the two small bodies, of which one is placed above each kidney. The literal translation of the expression, *referre kidinis,* seems to indicate a notion, entirely unwarranted by our knowledge of their organization and functions, that they might supply the place of the kidneys if they failed. These bodies are also called capulce renales or atrabiliares, and glandulae suprar-renaes. They are described in the article Kidney.

RENESBONA, in Geography, a river of America, which runs into lake Erie, N. lat. 41° 47'. W. long. 81° 55'.

RENETTE, in the Mange, is an instrument of polished steel, with which they found a prick in a horse's foot.

RENEWING of Leaves and Lives. See Reversion, Annuity, Political Arithmetic, &c.

RENFORCE, Fr., in Mufic, to reinforce, to pass from soft to loud, from loud to very loud, not all at once, but by degrees, swelling and augmenting the sound, whether a single note sustained, or a series of notes, till the order to reinforce the note or passage is fulfilled, and then return to the common degree of force.

RENFREW, in Geography, a royal borough-town in the county of Renfrew, Scotland, is situated near the south bank of the river Clyde, at the distance of five miles from Glasgow, and 45 miles W. by S. from Edinburgh. Though much inferior in magnitude and population to Paisley, it is the head-town, or capital of the county. This distinction it derives from its superior claims to antiquity, and from the circumstance of its being incorporated under a royal charter, originally granted by king Robert II., who had a palace in the immediate vicinity. In virtue of that deed it is governed by a provost, two bailies, and sixteen councillors. In former times it sent one representative to the parliament of Scotland, and is now a contributory royal borough with Ruther Glen in returning a member to the British legislature. About 200 years ago the Clyde passed close to the town, but the river afterwards deflected its ancient course, which has been converted into a canal communicating with its present channel. By this canal waleffs of 200 tons burthen are enabled to reach the town in spring tides; but notwithstanding the advantage of that conveyance, the trade of Renfrew is very inconsiderable; owing, as Mr. Forsyth judiciously remarks, "to the pernicious effects of borough politics, in withdrawing men from industrious habits and pursuits." A small manufacture of thread, and some soap and candle works, on a confined scale, constitute the chief support of the town; but many of the lower orders are likewise employed in weaving for the manufacturers of Paisley and Glasgow. With respect to buildings, Renfrew confiasts chiefly of one principal street, about half a mile in length, with several lanes diverging from it. The houses are wholly constructed of stone, but are extremely irregular as to size, form, and position. The public buildings are the church, which is parochial, the town-hall, and a grammar-school. The last is under the patronage of the town-council, and is at present conducted with much ability. There is no regular market held here, but provisions of all kinds may always be obtained at a reasonable price. The
fairs take place on the third Tuesday in May and July, the 29th of September, and the first Friday in December. A general post-office is established at Renfrew. The revenue of the corporation exceeds $200,000 per annum, arising from the rents of lands, customs, a salmon fishery on the Clyde, and the profits of a public ferry over that river. This ferry is perhaps the object most worthy of notice of any connected with the town. There is a ferry-house on each side of the river, the property of the corporation; and a ferry-boat constructed so convenient a manner, that a carriage, with a pair of horses harnessed, can be ferried over and delivered by one man in five minutes. This is accomplished by fixing, on both banks of the river, a rope which runs upon rollers at each end of the boat, and being pulled by the boatman it motion. Renfrew, as the chief town, is the place where all county meetings are assembled, and where the county quarter sessions of the peace are held.

Renfrew parish extends between three and four miles in every direction. The whole is level, inclosed, and in a high state of cultivation. The soil is a rich loam, and the climate is peculiarly healthy, though subject to occasional heavy rains. The burgh lands consist of about a hundred acres. This parish is intersected by the great road between Glasgow and Greenock. Ecclesiastically, it is within the presbytery of Paisley, and the synod of Glasgow and Ayr. According to the parliamentary returns of 1811, the number of households is estimated at 344, and its inhabitants amount to 2505. Beauties of Scotland, 8vo. vol. iii. Carlisle's Topographical Dictionary of Scotland, 4to. 1813.

RENFREWSHIRE, a county in the south-western division of the kingdom of Scotland, is bounded on the east by Lanarkshire, on the west, north, and north-east by the river Clyde, and on the south-west by the hills of Ayrshire. This county is of small extent, and of irregular shape; and contains, according to the parliamentary returns of 1811, 8296 houses, and a population of 92,596 persons. In general, and especially along the northern parts of it, the surface of the ground is level; but there are nevertheless several ridges of hills within its boundaries, some of which, upon the borders of Ayrshire, are of considerable elevation. The hills of Balgach and of Dunure rise to the height of 1000 feet above the level of the sea; and the isolated hill, called the Craig of Neilston, to 920. This last is covered with fine grass to its very summit. Those adjoining to Ayrshire, however, are bleak and barren; but command very fine views. On the south and west sides, the fertile vale of Cunningham, which seems at a distance to be wholly covered with wood, stretches itself to the shore of the Clyde; while on the north and north-east are the level parts of Renfrew and the city of Glasgow, with the lofty Ben-Lomond towering above the clouds, in the back-ground.

The rivers and lakes of this county are not of very considerable consequence in relation to themselves, but by the industry of the inhabitants on their banks, they have been rendered of great importance and utility to society. Unlike the romantic waters of Ayrshire, adorned with wood and exciting interest by the vestiges of ancient magnificence which they every where display, the streams of this district are made subservient to the purposes of human industry. If they descend from a height, it is not to add to the charms of the surrounding scenery, but to give motion to extensive machinery, inclosed within immense piles of building, where hundreds of mortals toil in the service of luxury, or form the materials which are to furnish clothing to distant nations. Here, if a stream spreads abroad its waters, it is not to embellish a park, but to afford convenience to a bleach-field, or to serve a reservoir for the mills in case of drought. In proportion as Glasgow is approached, every thing assumes an aspect of activity, of enterprise, of arts, and of industry. The principal streams are the White-Cart, the Black-Cart, and the Grif, which fall into the Clyde below Inchinman bridge. The White-Cart, which generally receives, by way of eminence, the Cart, runs in a direction from south-east to north-west, nearly parallel with the Clyde. It takes its rise in the moors of East Kilbride, Lanarkshire, and is particularly celebrated in ancient record for its fine large pearls. These, however, have long disappeared; but the river is now a source of more certain and beneficial wealth by its utility to the manufacturing interests of the county. Above Paisley, which stands upon its banks, it winds its way through a variety of small hills capable of cultivation to their summits; sometimes disappearing altogether, and again spreading its waters abroad into the plain. Below the town it is navigable for small vessels, and is thus beneficial to commerce and trade by facilitating the conveyance of goods. The Black-Cart rises out of Castle-Semple loch, in the parish of Lochwinnoch. From that beautiful lake it descends northward, and receives in its course the waters of the Grif. This last stream has its source in the elevated territory above Largs, which looks down upon the angle formed by the Frith of Clyde. After its union with the Black-Cart, these conjoined rivers flow into the White-Cart at Inchinman bridge. The lakes in the county, besides that of Castle-Semple above mentioned, are Queenside loch, in Lochwinnoch parish, two lochs in Neilston parish, and various other smaller ones, all of them appropriated to useful purposes.

The mineralogy of this county, though not so important as that of some others in Scotland, is nevertheless deserving of attention. In the parishes of Eaglesham and Kilbarchan, the mineral called the ofmnd stone is frequently found. This remarkable stone is of various colours, and when newly quarried, is so soft that it may be cut with a chisel; but afterwards becomes much harder. It breaks in all directions with unequal and harsh surfaces, readily absorbs water, and if recently heated, the absorption is attended with a hissing noise. Acids do not affect it, nor is it rent or melted by a strong heat. Hence it is much used for paving ovens, furnaces, &c. When burnt, it assumes a darkish colour, and lores three per cent. of its weight, but afterwards regains it by absorption. Some of it is very porous and, almost semivitrified, in which case, when struck, it emits a clear and strong sound. It is found in large masses in the form of rocks, having the intervening spaces filled with siliceous or calcareous spar, and occasionally with zeolite, feldspars, and barytes. This last mentioned substance is found in abundance at Balgach hill in the parish of Eaglesham, where are likewise two very noted mineral springs. But the chief field of minerals in Renfrewshire is that in the vicinity of Paisley, which extends on the one side into the parish of Kilbarchan, and on the other towards Glasgow. That part of it which is most singular is the coal at Quarreltown, which is undoubtedly one of the most extraordinary masses of that mineral hitherto discovered in the British dominions. Its thickness, measured at right angles, is fifty feet, and it consists of several layers or strata in contact with each other. In consequence of its enormous depth, it is wrought in different floors, in the mode practised in great open quarries. It is difficult to form a just conception of the manner in which this singular mass of coal lies. In a field of fifteen acres, it is found to dip in various directions. At least, conceiving a nearly circular area of these contents, the coal, from the north, the east, and south quarters of that circle, dips pretty uniformly towards the centre. This, however,
however, is in some measure interrupted by several hitches, at one of which the mass of coal is suddenly thrown up about fifty feet, at another above thirty. These hitches interrupt not only the direction, but the degree of the dip. On one side of the northern hitch, it is about one foot in three; on the other side, only one in fix. Some years ago, this bed of coal having taken fire, the pillars gave way and the ground sunk, leaving the surface in a very rugged state. The difficulties thus produced, however, have been surmounted, and this mineral treasure restored to all its utility. The other coal-mines in the county of Renfrew, are those of Hawkhead, Cathcart, and Kilbarchan. The first has been wrought above 200 years. In the fame neighbourhood, lime is quarried in great quantities, also in Cathcart parish. Iron-fore accompanies all the coal strata, but is more particularly abundant along the shores of the Clyde.

On the agriculture of Renfrewshire, it will be unnecessary to offer many remarks. Almost every portion of the county is inclosed and cultivated, but graft lands are far more predominant than arable fields. This arises from the great demand which exists for the products of the dairy, the garden, and the fold, in consequence of the vicinity of trading and manufacturing towns, and the vast importation of grain which takes place from other parts of the country, or from abroad. Here the farmers are more sensible than to object to a free commerce in that article; because they do not envy the inhabitants of lefs populous districts, who find no better employment for their lands than that of fattening them by endless crops of grain. One would imagine that the practice in this district alone ought to decide the principle of the corn laws. Here, free importation, so far from injuring the farmer, augments the value of the foil in every respect, simply by increasing the ratio of population.

The lands here differ according to their vicinity to the Clyde, or in the lower part of the county, according to their proximity to the waters of the Cart. In the parishes of Earl-Wood and the abbey of Paisley, the lands are beautifully intermixed with small rising hills, although the foil is generally of a thin clay. Here the farmers keep one half of their grounds in grafts, which they consider as the most important crop. In the upper district of the county, which comprehends the parishes of Mearns, Eaglesham, Neilston, Lochwinnoch, Kilbarchan, Erkine, and Kilmalcolm, the lands are peculiarly adapted for fatturing sheep, but none of them are so stocked, excepting some incoIOes about gentlemen’s feats, and a few parks in Neilston parish. The parish of Mearns is perhaps unequalled in Scotland for numerous small hills. The farmers here make large quantities of butter. The cows are small, of a brown and white colour, and are chiefly of the Ayrshire breed. Twelve of them afford, during the summer months, about sixty English gallons of milk daily. Towards the northern part of the county, in Kilmalcolm parish, the enclosures are generally formed of foines piled up to the height of four feet. The rotation of crops is three successive crops of oats, and fix years of fatturing. Farm servants are usually unmarried, and live in the farmers’ houses. The hofes are of the bell kind, and draw, in a single hofe cart, from 17 cwt. to a ton. Farms throughout the whole county are on a small scale; few of them exceed seventy acres.

Renfrewshire contains one borough-town, Renfrew, and three large manufacturing and commercial towns; viz. Paisley, Greenock, and Port-Glasgow, all of which are noticed under their respective names. Here are likewise several populous and thriving villages, such as Pollockshaws, Bridge of Johnstone, and Lochwinnoch, which are chiefly inhabited by weavers, who derive employment from the manufactories of Glasgow and Paisley. The principal manufactured products are thread, silk-gauze, and different kinds of cotton goods.

Various remains of antiquity are still visible in this county. At Paisley was a celebrated abbey for monks of the order of Cluni, the ruins of which are much admired. Here is also an old chapel, in the early pointed style, which is noted as the burial place of Margery Bruce, and several of the earls of Abercorn. In the parish of Kilbarchan, near Castle- Semple, is one of those monitory mafaies of whifflone, believed to be a Druidical altar. It is twelve feet in height, and sixty-seven feet in circumference; and is known by the name of Clochdorflione, a corruption of the Gaelic, Clocha-Druighe, the Druid’s flone. It is composed of the large flone of which the neighbouring hills are formed, and has probably been hewn from an elevated rock to the eastward, on which is a farm-house, called Clochdorrig; but by what mechanism it was conveyed cannot, in the present application of the mechanical arts, be easily determined. It rests upon a narrow base; but the lower part of it has been covered with stones gathered from the land. At some distance are several large grey flones, supposed to have been part of a sacred circle surrounding the altar. The parish of Cathcart is noted for being the scene of the battle of Langside, the last contested by the unfortunate queen Mary, to regain her authority. The place where the action was fought is an eminence rising rapidly on the north and west sides, and defended very gradually on the south and west sides. On the summit is an elliptical intrenchment, commonly called queen Mary’s camp; but which is undoubtedly of much higher antiquity, and probably of Roman origin. On an hill, opposite to Langside, is the old castle of Cathcart, near which queen Mary fled during the battle, and witnessed the discomfiture of her friends, and the annihilation of her hopes. On the other side of this range of hills is another ancient castle, now in ruins, which belonged to the ancestors of the great reformer Knox; and at a short distance from it, on an elevated rock, may be seen one of those green artificial hills, usually called moats. It is of a square form, the sides facing the four cardinal points; the westward rests on the precipitous edge of the steep rock; and the remaining sides are defended by a deep trench, cut out of the solid flone. Each side of this mount measures sixty feet in length at the base, and nineteen at the summit; and is twenty-one feet high. The top appears to have been a hollow square, surrounded by a parapet, with an entrance on the eastern side. No fewer than five other artificial mounts can be seen from the one described; also a Roman encampment near Paisley, distant about five miles. On the top of Barhill are the remains of a rude encampment, which occupies the summit of a precipice, formed of a perpendicular rock of a basaltie appearance, which defends it on the north; and on the south it has a parapet of loose foines. The tradition in the neighbourhood is, that it was an encampment of the celebrated sir William Wallace. The pinnacle of rock is flown where they say Wallace sat while he enticed the English forces into a bog at the bottom of the rock, where they were all destroyed; but no historian confirms this statement. In an isle of Castle-Semple loch is still to be seen the Pail or Peal, an old castle, to which the lairds of Semple were accustomed to retreat in times of unusual danger. In the lake, canoes hollowed out of finge trees, like those of the Indians, have been occasionally discovered. Lower down the country the ruins of the castle of Newark chiefly claim attention. It stands on the eastern point of the bay, on which the town and harbour of Port-Glasgow is situated.
situated. When entire it consisted of a square court, with a tower at one angle, which is by far more ancient than any other portion of the building. When, or by whom it was erected, is unknown: this castle was long the property of the Duncansfouns of that ilk, and afterwards came into the possession of the family of Maxwell. In this county is a variety of objects bearing the name of the renowned and patriotic Wallace, who was a native of the village of Elderslie, in the neighbourhood of the town of Paisley. See Wallace.

The only other objects of antiquarian interest we shall mention, are four communion cups, still preserved in Kil-malcolm parish, and which were used by John Knox in administering the sacrament of our Lord's supper. They appear to have been originally candelsticks; and it was perhaps only from the necessity of the times that they were converted to this pious purpose. They are of the purest silver; and, whether from the association of ideas, or their actual fashion, have a very antique and venerable appearance. Beauties of Scotland, vol. iii. 8vo. 1806.

RENGAH, a town of Sweden, in Weft Bothnia; 30 miles N.N.W. of Umea.

RENGO, a town of Sweden, in the province of Tavatland; 8 miles S.S.W. of Tavathus.

RENI, Guido, in Biography, the principal painter of the Caracci school, was born at Bologna in 1572. At an early age he became the disciple of Denis Calvert, a Fleming of great reputation, but afterwards studied under the Caracci, preferring the style of Ludovicus to that of Annibal, because there appeared more of grandeur and of grace in his compositions than in those of the others.

When he left the Caracci, he went to Rome; and with a mind intent upon forming a style of art for himself, studied the works of Raphael, with which he seemed enraptured; but the vigour and force with which the recent works of Caravaggio were conducted attracted him, and for a while he attempted to follow it. Happily he was diverted from it by an observation of Annibal Caracci; viz. that the best mode of rivalling the renown of Caravaggio might perhaps arise from a different mode of art, by contrasting his confined and lamp-like effects with a broader and more ample light; and for his vulgar forms, and obscure outline, substituting clearerness in the parts and forms, built upon the pure models of antiquity. This remark, made in plein air by Caracci, operated powerfully on the mind of his skilful pupil, and induced him to try its truth. He immediately devoted himself to the study of what was graceful and agreeable in form, colour, and effect; and his success is testified by numberless beautiful productions, of which we posses many in England, and France is still more rich in them.

His composition is not, however, so free from affectation as the nature of the subjects he chose demanded; the very attempt to make them graceful, too frequently militated against its object, and he subverted the grace of the theatre for that of nature. In his female heads and proportions, his model was the antique; and the character and features of the daughter of Niobe is discernible in most of them. He dredled them in becoming elegance, and executed the different parts with great freedom and truth of pencil; but not frequently, however, in a tone of colour too light, or too leaden for flesh; with a greenish hue, which rather characterises the hand of death, or the coldness of marble, than the glowing warmth of life, and the flexible softness of nature.

His disposition of draperies was elegant; judiciously applied to the filling up of voids in the grouping of limbs, or figures, and was wrought with the greatest freedom; yet finisht with almost minute attention to the foldings. These he arranged in a grand style, but they not unfrequently exhibit the study which he bestowed upon them; and appear to arise rather from the necessities of art, than from the passions of the figures. The execution of his pictures is of the most free and agreeable kind; manifesting a perfect understanding of nature; the touch being light, full, and delicate; and though they are finished very highly, yet there remains no appearance of labour. In expression, he sometimes attained the greatest perfection; as in the head of our Saviour in the Louvre, and of which the president Weiss has a very fine duplicate: but, in general, it was rather the grace and artifice of the theatre which guided him; and his figures appear to act more than to feel. Such was the respect paid to his abilities, that he was crowned with honour and riches; but it is lamentable to add, that one vice, in which he indulged after he had passed the meridian of life, viz. gaming, robbed him of both, and reduced him to poverty and disgrace; from which he was not able to free himself during the remainder of his life, which continued till he had attained the age of 67.

In the gallery of the Louvre there are between 30 and 40 of the works of Guido, large and small, and in his various manners; and as he there comes in immediate competition with his masters, connoisseurs have an excellent opportunity of judging of his comparative merit. We have also a great many of his easel pictures in England, but they are scattered about in various collections.

RENI, in Geography, a town of European Turkey, in Bessarabia, on the Danube, 40 miles W. of Imsah. N. lat. 45° 23'. E. long. 28° 44'.

RENIIFORME Folium, in Botany, a kidney-shaped leaf. See Leaf.

RENTENCY, Rentention, or Reniicius, among Philosophers, that force in solid bodies, by which they resist the impulsion of other bodies; or react as much as they are acted on.

RENKY, in Rural Economy, a term provincially signifying tall or high, when applied to animals, &c.

RENETBAUK, in Geography, a river of America, in the province of Maine, which runs into the Atlantic. N. lat. 43° 20'. W. long. 70° 27'.

RENETTO, a town of Norway, in the province of Drammen; 36 miles S. of Drammen.

RENNEL'S Sound, a bay of the North Pacific ocean, on the W. coast of Queen Charlotte's island. N. lat. 53° 28'. W. long. 133° 5'.

RENNERSDORF, a town of Silesia, in the principality of Neisse; 8 miles E. of Neisse.

RENNES, a city of France, and chief city of the department of the Ille and Vilaine; and, before the revolution, the see of a bishop, and capital of Bretagne; situated on the Vilaine, by which it is divided into two parts. It is large and populous, containing eight paroch churches besides the cathedral and several convents. The four parts which it comprehends are designated the north-east, south-east, south-west, and north-west. The first contains 5950 inhabitants, and its canton 13,147, on a territory of 1424 square kilometres, in 7 communes; the second contains 5753 inhabitants, and its canton 12,654, on a territory of 971 square kilometres, in 4 communes; the third contains 3261 inhabitants, and its canton 12,254, on a territory of 1424 square kilometres, in 9 communes; and the fourth part contains 11,420 inhabitants, and its canton 13,332, on a territory of 375 square kilometres, in 3 communes. N. lat. 48° 7'. W. long. 1° 36'.

RENET,
RENNET, in Rural Economy, a term applied to the coagulum for making cheese. It is prepared from the bag, maw, or stomach, of the young calf, by a sort of salt pickle. It is of vast advantage in the art of cheese-making to have good sweet rennet, the particular mode of managing which may be seen under the heads CHEESE, DAIRY, and DAIRYING.

The preparation is formed in different modes, in different cheese districts, in the different parts of the kingdom; but mostly either in the manner of a solution, or that of a dry skin. As there is, however, much variation in the quality or strength of the different skins, it is probably the best method to reduce them into the flake of a solution; as, by that means, the necessary quantity, in every case, may be the best ascertained.

In some places, it is found most certain practice to prepare the whole of the dried maw skins, which are required for a season, at one time, by pickling and steeping them in different separate quantities of pure spring water and salt, in an open vessel, or vessels, mixing the different infusions together, and then passing them through a fine linen sieve, afterwards adding rather more salt to the whole than can be retained in the flake of solution, as shown by the appearance of some at the bottom of the vessel. The extraneous scummy matter, that comes to the surface, is continually to be removed as it rises, and fresh portions of salt occasionally supplied, as they may be wanted. In this flake it is ready for use, about four ounces being sufficient for a large cheese.

In other parts, the maw skins are simply well salted, and steeped in salt pickle for some length of time; then well dried, by being spread out by means of small pieces of flicks; in which litre, they are made use of, by cutting pieces from the top and bottom parts of them, about the size of a half-crown for a middling-sized cheese, those parts are in general the strongest.

And the following method of preparing rennet is practised in the northern parts of the island, and described as the most approved method in the Report on Agriculture for Argyleshire. Take the maw skin of a calf, which has fed entirely upon milk: after it is cold, wash it gently in water, fill it nearly with salt, and place it on a layer of salt in the bottom of an earthen mug. One or two more, with salt between, and a good deal above them, may be put in the same mug, and kept in a cool place, with a flat on the top, for six or eight months, or till cheese-making time next season. The skins are then taken out, and the brine allowed to drain from them; after which they are diffused on small hoops or splinters put crose-wise within them, till they dry. Put the skins then in an open vessel, with three pints of pure spring water for each skin. Let them stand twenty-four hours; after which take them out, and infuse them other twenty-four hours in other water, but not more than a third of the former quantity. Mix these two infusions together, pass them through a fine linen sieve, and give them salt till the water is more than tautorated, and some remain undiluted at the bottom. Rather less than a gill will serve for thirty-eight pounds of cheese. It is remarked, that, instead of two infusions, one use only one, giving four English pints to the skin, and direct the water to be first boiled, and mixed with salt into brine that will swim an egg, and then to let the heat go off till it is lukewarm, before the skin is put in twenty-four hours to steep.

It was formerly the practice to mix different kinds of aromatic herbs with the rennet; but the custom is much laid aside at present. The manner of doing it is this:

when the maw skin is well prepared, two quarts of soft pure water should be mixed with salt, in which should be put sweet briar, rose-leaves, and flowers, cinnamon, mace, cloves, and, in short, almost every sort of spice and aromatic that can be procured. Boil them gently till the liquor is reduced to three pints, taking care it be not smoked. Strain it clear from the skins, and, when milk-warm, pour it into the maw; a lemon may then be siced into it, and remain a day or two, after which it should be strained, and put in a bottle well corked, and it will keep good for a year or more. A small quantity will turn the milk, and give the cheese a pleasing flavour.

RENO, in Geography, a town of the island of Corflca; 3 miles N.E. of Vico.

RENO, a river of Italy, which rises a little to the N. of Pifilioa, and runs into the Po, 4 miles above Ferrara.

RENO, a department of Italy, so named from the above-mentioned river. It consists of part of the Bolognese, and contains 199,300 inhabitants, who elect 15 deputies. The capital is Bologna.

RENOGRUND, a small island on the E. side of the gulf of Bothnia. N. lat. 63° 59'. E. long. 23° 3'.

RENOVATOR, in Horology, is a watch that has the property of renewing the power of its main-spring, or of winding itself up, by periodic jerks that it receives from the human body in motion. Recordon of Charing-Crofts, London, took out a patent for this contrivance some years ago, which is more ingenious than useful: for, while it professes to keep the watch going, without the usual winding up, so long as the watch is worn in the pocket, it foregoes the more useful property of the fusee, and renders the maintaining power very unequal at different times of the day. And should the watch remain unfurnished, or laid down in a state of rest, for more than 24 hours, it will cease to perform; so that instead of being a watch that will go without winding, it requires to be wound many hundred times in the day, by small successive quantities, before it will continue to perform throughout the night. We have been favoured by the inventor with a copy of so much of the specification as will suffice to give our readers an idea of the mechanism, and of its mode of action; both which we have examined, and found corresponding with the specification. Others have varied the construction; but the original, we conceive, will be deemed sufficient for us to particularize, which we will do by a reference to figs. 1, 2, and 3, in Plate XLIII. of Horology, which are copied from the inventor's drawing.

Extract Copy of the Specification, N° 1.—"Letter H represents a weight of silver, or other metal, which is in equilibrium in the position it is viewed, being sustained so by a spiral spring fixed to its arbor, as described by fig. 3. In wearing the watch, or by any external motion that lifts the watch up, it looses its state of rest; and by its vis-inertiae (matter) overcoming the strength of the spring, it yields to the laws of gravity, and falls upon the lower spring, marked ee. When the watch, by the motion of the body, descends, the spring ee, and the aforesaid spiral spring, are left at liberty to exert themselves, and return the weight upwards, till it touches the other spring ee; and thus, by the motion of the body, is this weight alternately thrown up and down, which turning the ratchet-wheel, marked C in fig. 2, which is fixed on the arbor of the weight just below the spiral spring, gathers a few teeth every motion in the wheel P, and being prevented from returning by the click M, carries forward the wheel with a pinion of 16, marked E, which turns the wheel B; which having a pinion of 12 at G, takes into and turns a wheel under the barrel A, which is fixed on the barrel arbor, and by that means is the spring wound up.

The
The upper part of the barrel arbor, marked \( b \), has a tooth, which gains a tooth in the wheel, \( a \), every revolution; and that brings the pin \( c \) nearer to the centre, which, when it arrives in a certain position, raises the piece \( K \) (Fig. 1.), of which the centre, \( B \), (not seen in the figure) is conical, in order that when the said pin \( c \) comes near it, it raises it with ease, and forces it into the holes, marked \( N, N, N \), in the weight marked \( H \) (Fig. 1.), which effectually stops its motion, and prevents the ill confluence of over-winding.

\( L \) is a cock that carries the pivot of the barrel's axis.

\( A \) is the barrel which carries a wheel, that catches the pinion \( D \), which carries the minute-hand."

The patent was obtained in July 1780; and part 2d of the specification contains drawings, and a plan for applying the same principle to the fusee; but we do not understand that it has yet been made to answer.

RENRUTH, in Geography, a town of Germany, in the county of Hanenburg; 3 miles S. of Schleufingen.

RENS, RENSE, or RENS, a town of France, in the department of the Rhine and Moselle; near which, in the Rhine, is a remarkable monument of antiquity, called the "Königstuhl," or "Thronus regalis," consisting of a round vault, built of freestone, and resting upon nine stone pillars, one of which stands in the middle. This vault is 80 feet in circumference, furnished above with seven seats, agreeable to the number of electors at that town. The ascent to it is by stairs of stone, consisting of 28 steps, and it has two strong doors. On this regal chair the electors formerly held previous consultations for some time, concerning the election of a king and emperor; and when that election could not be performed at Frankfort, it was done at this place; and here were also transferred the notification and elevation of the elected personne, and also the consultations of the electors concerning the weighty matters of the empire, as well as a solemn confirmation of their privileges on the part of the emperors. Here also was established, in the year 1338, the elecoral league. Maximilian I. is thought to have been the last emperor who was brought hither; 5 miles S. of Coblenz. N. lat. 50° 18'. E. long. 7° 25'.

RESEN, a lake of Prussia, in the patinate of Culm; 10 miles N.N.E. of Culm.


RENSSELAERVILLE, or Rensselaerwick, a township of Albany county, New York, bounded S. by Columbia county, and W. by Hudson river. In this township, opposite to the city of Albany, is a medicinal spring, containing most of the valuable properties of the celebrated waters of Saratoga.

RENT, REDITUS, in Law, a profit, such as a sum of money, or other consideration, inflowing yearly out of lands or tenements, alienated on that condition.

The word rent, or render, \( reditus \), signifies a compensation, or return; it being in the nature of an acknowledgment given for the possession of some corporeal inheritance.

Co. Litt. 144.

It is thus called from the corrupt Latin, \( rentida, for reddita, of redditus \); because, as Fleta tells us, \( retrit et quotannis reedit. \)

The original of rents is to be sought for in the constitution of the ancient feuds, which were of a military nature, and in the hands of military perfous: however, the feudalities, being under frequent incapacities of cultivating and manuring their own lands, soon found it necessary to commit part of them to inferior tenants, obliging them to such returns in service, corn, cattle, or money, as might enable the chief feudalities to attend their military duties without distraction; which returns, or \( reditus \), were the original of rents.

Under the pure feudal system, this \( reditus \), return, or rent, consisted, in chivalry, principally of military services; in villegage, of the most slavish offices; and in foggage, it usually consisted of money, though it may still consist of services, or of any other certain profit.

Rent is regularly due and payable upon the land from whence it issues, if no particular place is mentioned in the reservation (Co. Litt. 201.) but, in case of the king, the payment must be either to his officers at the exchequer, or to his receiver in the county. (4 Rep. 73.) And strictly the rent is demandable, and payable before the time of harvest, in which case it is reserved; though some have thought it not absolutely due till midnight. 1 Sumn. 287. Prec. Chanc. 555. Salk. 578.

The usual remedy for non-payment of rent is distress; however, by the common law, distresses were incident to every rent-service, and by particular reservation to rent-charges also; but not to rent-fees, till the statute 4 Geo. II. c. 28. extended the same remedy to all rents alike. Moreover, by this statute it is enacted, that every landlord, who hath, by his lease, a right of re-entry in case of non-payment of rent, when half a year's rent is due, and no sufficient distress is to be had, may serve a declaration in ejectment on his tenant, or fix the same upon some notorious part of the premises, which shall be valid, without any formal re-entry or previous demand of rent. And a recovery in such ejectment shall be final and conclusive, both in law and equity, unless the rent, and all costs, be paid or tendered within six calendar months afterwards. Other remedies are action of debt, an affize of mort d'anceter or novel disfamion, the writ de confuetudinibus et servitiis, which compels a specific payment of the rent, the writ of ecclesiavit, and the writ of right fur disclaimer.

For an account of the rental of England and Wales, see Political Economy.

The lawyers ordinarily reckon three sorts of rents, vis. rent-service, rent-charge, and rent-fee.

Rent-service, is where a man holds lands of his lord by fealty, and certain rent; or by fealty-service, and certain rent; or that which a man, making a lease of lands to another for term of years, referreth to be yearly paid for them.

Rent-service is so called, because it hath some corporal service incident to it, as at the leafy fealty, or the feudal oath of fidelity. (Co. Litt. 142.) For, if a tenant holds his land by fealty, and 10s. rent; or by the service of ploughing the lord's land, and 5s. rent; these pecuniary rents, being connected with personal service, are therefore called rent-service. And for these, in case they be behind, or in arrear, at the day appointed, the lord may distrain of common right, without referring any special power of distress ; provided he hath in himself the reversion, or future estate of the lands and tenements, after the leaf or particular elette of the leefee or grantor is expired. Litt. § 215.

Rent-Charge, is where a man makes over his elette to another by deed indented, either in fee, or fee-tail, or for term of life; yet refers to himself, by the same indenture, a sum of money yearly to be paid to him, with a claus of
 distint for non-payment: so called, because, in this manner, the land is charged with different rents for the payment of it.  

Co. Litt. 143.

Rent-Sec., or Dry-Rent, or barren-rent, is that which a man makes over his estate by a deed indented, referew yearly to be paid to him, without any clause of distress mentioned in the indenture. There are also other species of rents, which are reducible to these three.

Rents of Affize, are the certain established rents of the freeholders, and ancient copyholders of a manor; thus called, because affized and certain, in opposition to reeditus mobiles.

Those of the freeholders are often called chief rents, reeditus capitale; and both sorts are indifferently denominated quit rents, because by them the tenant goes quit and free of all other services. When these payments were refered in silver or white money, they were anciently called cubite rents, or branch-farms, reeditus albi; in contradistinction to rents, refered in work, grain, or bafer money, which were called reeditus nigra, or black-mail. 2 Int. 19.

Rent, fee-farm, is a rent-charge flowing out of an estate in fee; of at least one-fourth of the value of the lands at the time of its revocation. (Co. Litt. 143.) Rack-rent is only a rent of the full value of the tenement, or near it. For a grant of lands, refering so considerable a rent, is indeed only letting lands to farm in fee-simple, instead of the usual method for life, or years.

These are the general divisions of rent; but the difference between them (in respect to the remedy for recovering them) is now totally abolished; and all persons may have the like remedy by distress for rents-feefee, rents of affize, and chief-rents, as in case of rents refered upon lease. Stat. 4 Geo. II. c. 28.

Rent, Refoluts, are reckoned among the fee-farm rents to be sold by the flat 22 Car. II., being such rents or tonts as were anciently payable to the crown from the lands of abbeys and other religious houses; which lands, upon the dilution of abbeys, being demised to others, the said rents were still refered, and made payable to the crown.

Rents, affart, channtry, chief, gold, foreshal, rack, quit, and white. See the several adjectives.

Rent, in Agriculture, the price paid for lands as farms by the tenants of the proprietors. The rents of lands are so extremely various, according to the nature of the soil, situation, markets, the state of the fences, buildings, and other conveniences, the ease of obtaining manures, and many other circumstances, as to be almost incapable of having any general specific prices affixed to them. They were formerly, especially in the northern parts of the island, paid in produce and personal services; but at present, according to Mr. Donaldson, over the greater part of the island, they are paid in money, and at two periods or terms in the year. In England, Michaelmas and Lady-day are the customary terms of payment; but the first payment commences six months after entry to the possession of the farm. But that in Scotland, the ordinary terms are Martinmas and Whit-tunited, or Whittunited and Martinmas, the tenant being allowed twelve months' credit of the first half of the rent in the one cafe, and in the other eighteen. And he observes, that this difference in the terms of the payment of rents is material in the purchase of landed property, being in general nearly one-year's purchase in favour of England.

And it is farther stated, that it was the custom of former times, in various parts of Great Britain, for the tenants to pay what was called for-hand rents, that is, paying the half, and in some cases, the whole year's rent immediately on entering to the farm, and before any benefit was derived from the possession of it. This practice, however, now generally diffused, although still kept up in some parts of Staffordshire and Perthshire, in some degree. And we believe that it still prevails in some places in Ireland. It is likewise added, that letting lands for a term of years at the former rent, but making the farmer pay a considerable sum in ready money by way of fine, was also a very common custom; but is now chiefly confined to the crown and church lands in England. This mode was evidently attended with bad consequences. By draining the tenant of all, or greatest part of his ready money, he was prevented from improving his farm. Leaves of lands are considered in law as heritable property; therefore, in the event of the demise of the tenant, soon after having completed a transact on of this nature, his eldest son succeeded to the lease, and the widow and other children were of course, in many instances, reduced to poverty; all that was left to them being their proportion of the ftock on this farm, and often thereby the heir was rendered incapable of keeping possession of the farm. In a word, in nine cases out of ten, it was robbing the tenant of the well-earned reward of his industry, during the existence of the former lease, and depriving him of the means of turning his new acquisition to the best account; without giving any solid advantage in return for it.

It is remarked also, that along the greatest part of the east coast of Scotland, which is the principal corn country in the kingdom, a considerable proportion of the rent of almost every farm is paid in grain and oatmeal. These articles being less fluctuating in their value than money, this appears the most equitable mode in which the rents of corn farms can be paid. It may indeed affect the farmer's interest when any sudden and unexpected rise takes place in the price of grain; but if a judgment can be given from experience, it will be found this very durable hands. On the contrary, for these last twenty years, with only two exceptions, 1783 and 1795, the price of grain, owing to the operation of the corn laws, has been extremely moderate, while every other production of a farm has been doubled in value, and in many cases tripled. Since these periods, the price of this article has, however, risen, and continued high. The public are often essentially benefited by so great a proportion of the rents being paid in this way. Many of the proprietors have granaries erected on their estates, where, in times of plenty, they store the grain and meal which they receive from their tenants. And every person, who is in any degree acquainted with the agricultural exports and imports which take place between some districts in Scotland and others, must, he thinks, know that the supplies afforded on many occasions from these forehouses have been the means of preventing scarcity, and an unreasonable advance in the price of these articles in the large manufacturing towns and other populous places. In East Lothian, according to the agricultural report of that district, it has been suggested by some proprietors, that one half of the rent should only be paid in money, the other in kind; and assigned as a reason, that the profit or loss arising from any material, as the rife or fall in the price of grain, would, in that way, be equally divided between the landlord and tenant. This is a mode probably founded on equity and justice. And it is further stated, by the first writer, that in the most northern parts of Scotland, the rents are, to a certain extent, paid in personal services. The tenants are bound to plough and harrow a certain portion of the landlord's farm, to reap, carry home, thresh, drive, and mill a certain quantity of the crop. They are also bound to pay poultry, eggs, butter, cheese, sheep, swine, linen
RENT.

linen yarn, flax, &c.; in a word, they are more the slaves of the landlord than their own masters.

These are shameful feudal practices, which the proprietors of such lands should remove as soon as possible, as without it their interests must suffer greatly from the lands remaining without improvement. Besides, it is a species of bondage highly disgraceful to civilized society. The able author of the Agricultural Report of the county of Argyll in Scotland, thinks that all services, whether paid to the master or to any under him, should be entirely abolished; and all rents formed into one sum of money, including public burdens, such as ministers' stipends, schoolmasters' salary, road money, &c. Thus, says he, the tenant would have always a clear view of the amount of his rent, and face time and trouble, and perhaps expense, by having to settle with one only instead of many. His time is precious, and should never be thrown away without necessity.

In regard to the parliamentary and parochial taxes, they may be paid to be paid, the first writer says, by the tenants over the greatest part of both kingdoms; and many leases contain a clause, he observes, binding the tenants to pay, not only all the taxes that are imposed, but also all that may be imposed. But, he thinks, that it appears absurd that the proprietors, whose interest it is to attend to the increase or decrease of all such taxes as more immediately concern their property, should devolve the payment of those taxes on their tenants.

They must know, that whoever pays them in the first instance, to them the lands are of less value, in consequence of such taxes having been imposed. They ought also, he thinks, to consider that their influence might be the means of keeping the most extravagant of them, such as the tithes and poors' rates, within more reasonable bounds, than it is to be expected the utmost exertions of the tenants can be able to effect. And that, further, proprietors could ascertain the value of their property with more minute exactness, were they, on the one hand, to receive from their tenants the full rents which their lands are worth, and, on the other, pay all taxes to which they are subjected.

The interest of agriculture, and the ease and comfort of the farmers, would at the same time, he thinks, be essentially promoted, were they relieved from these tithing exactions and compositions with which they are so frequently molested, particularly in this part of the kingdom.

And he adds, in respect to the general price of renting lands, that when it is considered how many circumstances operate in determining the rent of land, and how much they frequently vary in the same parish or lordship, it will be found impossible to form any correct idea in regard to the rents payable by the acre for the various kinds of soil over the whole island. Any conjecture that may be formed (for the subject admits, he says, no more) must be vague and incorrect. It is supposed, that the remarkable change that has taken place in the situation of the kingdom and the manners of the people, by the abolition of the feudal system, the increase of commerce, manufactures, and agricultural improvements, with the immense additional quantity of paper-money introduced within these few years into circulation, have had the effect of enhancing both the value and rent of lands. While these flourish, and paper-money supports its nominal value, lands in property or lease must necessarily, he thinks, continue to advance. But that, should any crofs accident interrupt the former, or depress the value afoficated to the latter, the recent great advance in the rent of lands, in various parts of the island, would render such calamities more universal in their effects, and of course of more serious consequence to the country.

The rent of land is kept up by a great variety of local causes, as the particular nature of the farms, their extents, the goodness of the roads and markets, the convenience of canals and other sorts of water carriage, and many other circumstances of a similar nature. In dairy and grazes districts, as well as some others, rents are kept up by the particular modes of occupation, in many instances. Many little advantages are connected with the former, while the latter has not any heavy expenses to contend with. Small farms are constantly higher rented than those of the larger kind. Convenient carriage and large markets are always favourable to rents. Local convenience has invariably great influence in raising the rent of land. In short, it has been suggested by an able writer, that every fort of improvement in agriculture, as well as manufactures, has a tendency to advance the rent of land; and that, if, to the practical excellence of the former, improvements in the latter should be added, with a more extended commerce, rents may be raised to an extraordinary degree. While the contrary of these matters is calculated to reduce the quantity of wealth, and, of course, to lower the rent of land; consequentially rent rises and falls with the prosperity or declension of the agriculture, the manufactures, and the commerce of the country, the former of which is only to be preferred by peace.

But though the rents of land have been greatly increased within these few late years, it is probable that they must feel the effects of the vast load of taxation and other charges which bear so hard upon agriculture at present.

But the ascertaining of the rents of lands in the different districts of the kingdom is a point of considerable importance both in a political and agricultural view, as by such means the produce of them may be better and more certainly calculated.

Mr. Smith, in his valuable Agricultural Survey of Argyllshire, states, that the quality of the soil is there extremely different; so that such valuations as have been lately made, differ, sometimes on the same farm, from £2. to £3. the acre of arable ground. The farthing, too, being partly green hill, but moily heath, differs no less in its quality than the arable land. Some of it is valued below 4d. and some above 4s. the acre. In the neighbourhood of Campbeltown, a few laps of arable land let from 2s. to 3s. the acre. But this price may be far to be put, not altogether upon the land, but partly upon the accommodation. But what proportion the rent of a farm should bear to its produce, depends so much on soil, climate, situation, and other circumstances, that no general rule can, he thinks, be laid down on the subject. In regard to arable lands more particularly, it is a common, though perhaps not a just remark, that one-third of the produce should go for rent, one-third for expence and management, and one-third for the farmer's profit, interest, &c.

But Mr. Middleton remarks, that the method practised by some gentlemen, of estimating the produce of land by trebling the rent, is very fallacious: three times the rent is not by any means equal to the value of the produce of the land under the old system of husbandry now in use; though under the old exploded course of fallow, wheat, oats, in the scanty produce of common fields, and when taxes and the expences of living were at one-half of the present amount, it was not very distant from the truth. But under the more improved courses of husbandry on land, at and under twenty shillings an acre, the produce is now, he thinks, more generally worth from five to seven times the rent.

In the North Riding of Yorkshire, as stated in the report of that district, the average rent of farms of pretty good soil is from £3. to £15. per acre, in which there may be land rated £4 S. 27.
at from 52. to 352. per acre, so that the average value of a farm will vary according to its proportion of good and bad land. Some farms of the latter kind may be let as low as 35. per acre, and some let cheaper at 30.; so great is the inequality of the soil, that nothing accurate on this head can be flated. Near large towns, land for convenience in small parcels, and in the aggregate to no great amount, is let at 52. or 42. per acre.

But in the western district of that county, as about Skipton and Settle, the lands were found to let as high as 42. and 52. the acre; while from the bell information in the corn part of the county at the same time, 20. and 30. were considered as a high rent, and in many places it was still much lower.

In Shropshire, the rents of lands, where the roads are bad, and the grounds little improved, are from 8s. to 12s. the statute acre, and in more favourable districts and situations, from 15s. to 20.; the farm together. But near towns, the price is much higher, as from 2l. to 6l. the acre.

And in Norfolk, according to Mr. Young, in the light land district, as marked in the Survey, the average price of letting is 6s. the acre; the various loams at 16s.; the better lands at 12s.; the rich loams 26s. and the marsh land clays 28s.

In Suffolk the several soils are flated to be rented as below, the whole county included, sheep-walk, waike commons, &c. which are very large deductions from the rate of the cultivated lands:

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>1s.  d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong, wet loam</td>
<td>13</td>
</tr>
<tr>
<td>Rich loam</td>
<td>14</td>
</tr>
<tr>
<td>Sea district of land</td>
<td>10</td>
</tr>
<tr>
<td>Western district of ditto</td>
<td>6</td>
</tr>
<tr>
<td>Fens</td>
<td>2</td>
</tr>
</tbody>
</table>

But in all the districts, with the exception of the fen, there are tracts that are let at 20. to 25. and even higher, especially meadows.

In the county of Suffolk, the average rent of good landed farms may be flated at about 20. or 25. the acre. They have lately increased very much in some places.

In Suffec, good land is rented at from 20. to 30. the acre, but there is a great deal let at much lower rents.

Land has risen much of late years in many parts of the country.

In the county of Oxford, the rent of land is very various. The red land lets on the average at 30., the miscellaneous loams at 25.; the flone-brafts at 20.; and the Children at 16. the acre. There are, however, large portions of land let at till lower rents in different parts.

In Cheshire, the land averages full 30. the acre in rent as farms; and in Lancashire, the rent of land is equally as high, if not higher.

In the very south-western district of Cornwall, the rents of land fluctuate very greatly, as from 5. to 50. the acre in farms properly so named. The circumstances affecting rents here, besides the quality of the soil, and the aspect or situation, are the vicinity to sea land, and to market towns. There are influences of land letting very high in particular situations, as at 13. the acre about Penzance. But in the same parishes the rents of land sometimes vary from 52. to 5s.; and, even on the same farm, not exceeding 150 acres, some parts are worth 50., and others not 52. the acre.

The neighbourhood of towns and large markets, as well as of extensive manufacturies, has, in all cases, a tendency to raise the rent of land, whether as farms or otherwise, in every part of the kingdom.

In all parts of Scotland, even in the Highlands, the rise of rents has been gradual and progressive for many years, and in some places they have been more than doubled within these last twenty-five or thirty years. It has been flated by Mr. Collingworth, of Daventry, in the fourth volume of Communications to the Board of Agriculture, that in respect to the principle of increasing rents, where liberty is given to break up old grafs or pature lands that are under leaf, that he has known, within this five years past, a double rent given for leave to plough up an old pature for cropping for three years; and that consequently it appears to him that a flatement of the expenses and profits upon arable and pature lands should be severally made out, to ascertain by how much the balance of profit of the one exceeds that of the other. He therefore flates them, upon a probable calculation, in the following manner:

Table of Expenses.

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td>Wheat</td>
<td>Peas</td>
<td>Wheat</td>
<td>Beans</td>
<td>Sp. Wheat</td>
<td>Total</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>£  s. d.</td>
<td>£  s. d.</td>
<td>£  s. d.</td>
<td>£  s. d.</td>
<td>£  s. d.</td>
<td>£  s. d.</td>
<td>£  s. d.</td>
</tr>
<tr>
<td>Rent and taxes</td>
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<td>1 15 0</td>
<td>1 15 0</td>
<td>1 15 0</td>
<td>1 15 0</td>
<td>1 15 0</td>
</tr>
<tr>
<td>Seed</td>
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<td>0 16 0</td>
<td>0 18 0</td>
<td>0 16 0</td>
<td>1 0 0 0</td>
<td>1 0 0 0</td>
</tr>
<tr>
<td>Ploughing</td>
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<td>0 12 0</td>
<td>0 12 0</td>
<td>0 12 0</td>
<td>1 0 0 0</td>
<td>1 0 0 0</td>
</tr>
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<td>Harrowing</td>
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<td>0 2 0</td>
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<tr>
<td>Manure and carting</td>
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<tr>
<td>Frightening birds</td>
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<td>0 0 0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>Weeding and hoeing</td>
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<td>1 16 0</td>
<td>1 16 0</td>
<td>1 0 0 0</td>
<td>1 0 0 0</td>
<td>1 0 0 0</td>
</tr>
<tr>
<td>Reaping and mowing</td>
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<td>1 0 0</td>
<td>1 0 0</td>
</tr>
<tr>
<td>Cocking and raking</td>
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<td>0 2 0</td>
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<td>0 2 0</td>
<td>0 2 0</td>
</tr>
<tr>
<td>Carrying and filing</td>
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<td>1 0 0</td>
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<td>1 0 0</td>
<td>1 0 0</td>
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<td>1 0 0</td>
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<tr>
<td>Thrasing and winnowing</td>
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<td>Contingencies</td>
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</table>

| £ 18 0 | 5 1 6 | 7 7 6 | 5 1 6 | 7 0 6 | 5 1 1 6 | 35 0 6 |

Produce.
**RENT.**

Produce.

<table>
<thead>
<tr>
<th>Item</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pease, three quarters, at 48s.</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2. Lammas wheat, three quarters and a half, at 52s.</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3. Pease, three quarters, at 48s.</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4. Lammas wheat, three quarters and a half, at 52s.</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5. Beans and turnips; five quarters of beans, at 30s.; turnips, 30s.</td>
<td>5</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6. Spring wheat, three quarters, at 48s.</td>
<td>5</td>
<td>4</td>
<td>0</td>
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<tr>
<td>Straw</td>
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<table>
<thead>
<tr>
<th>Tillage produce</th>
<th>£</th>
<th>s</th>
<th>d</th>
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</thead>
<tbody>
<tr>
<td>Ditto expences</td>
<td>54</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ditto expences</td>
<td>35</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grazing Expences.</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent and taxes</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Labour ditto</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grazing Profit.</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>A bullock and a half to three acres, at 5l. per head</td>
<td>7</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Three sheep upon ditto, at 25s. per head</td>
<td>3</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Grazing produce of three acres</td>
<td>11</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
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<th>Then say, grazing profit per acre.</th>
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<td>To which add for grass seeds</td>
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<td>The additional rent to make up the sum as per contra, will be</td>
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<th>6(= 3l. 3s. 3d. profit per acre for the farmer.</th>
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By this means the rent that can be afforded to be given may be ascertained with tolerable correctness in many instances of farming. See Grass Land.

The author of the Argyleshire Agricultural Survey, after remarking that there is very little arable land in that county but which is capable of higher cultivation, besides the great quantity of waste ground that may be improved in almost every farm, says, that the land is therefore capable of being made to yield a much higher rent when better cultivated; though not a great deal of it, as is generally thought, can bear much more, in the present stage of improvement, than what is laid on already, unless it be under a different management, which in sheep lands might be by the introduction of better woolled breeds, and in arable lands by adopting a better system of husbandry.

It is conceived, that the idea of high rents being a spur to improvement and exertion, is a common, and, to a certain extent, a just maxim. No doubt there may be some who, if they had the land for nothing, would be ruined by their indolence. But the more common case is, that when a tenant feels that all his exertions will not do, he becomes dispirited and desperate, and allows himself to be carried along by the stream which he cannot stem. The land suffers, the tenant fails, the farm gets a bad name, and the rent must be lowered. Thus the landlord, as well as the tenant, suffers, by rising the rent higher or falling than the improvement of the land will bear. But he adds, that a substantial tenant is generally cautious of engaging to pay a rent that is exorbitant. He sees the success of those who invest their money in other branches of business; and he follows their example, if he has not the prospect of a farm's yielding him full interest for his money, and an adequate return for his diligence and labour. Whereas he who has least to lose, is often the most forward to offer, and the landlord is often tempted to accept the offer, without considering that a capital is necessary for paying the rent, and improving the land. Instances of ruin to the tenant, and loss to the landlord, from too high rents, are not unfrequent, especially on some of the smaller estates. Most of the farmers toil hard, live poorly; and for one who has a trifle for his pains, perhaps two give their pains for nothing. Many who have old leafs obtained before the late rise in land, and in its produce, took place, are very well, as are also many of those who have sheep flocks; as their possessions are managed with less expense, and the value of some of them was not well known till they were tried under the sheep system. But even bad

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*4 S 2* bargains
bargains are become good by the late rise on every article of produce; and most of those who have leases are at present at their ease.

It is concluded that the occupiers of land, whether in paiturage or tillage, ought certainly to be able, like labourers or tradesmen, to live by their occupation, and to support their families by their daily care and labour. The interest of money invested in their flock, with the proper allowance for feed, wear, and risk, they should be able to save as a provision for their families, and for old age; as the money so invested would give this return, if laid out on interest, without any trouble whatever. It cannot be considered as any part of the produce of the ground; and therefore no part of it ought, in equity, to enter into the payment of the rent; and yet not one in ten, perhaps, is able to save it; nor do they commonly advert that so much ought to be saved in justice. They are generally satisfied if they can keep their flock undiminished; so that the busines, in general, returns much less to those engaged in it than almost any other. A happy predilection in favour of the occupation in which they were brought up, is, he thinks, what induces so many to follow it. Perhaps it may be also said, that there is implanted in the human mind, for wife purposes, a certain innate disposition, or instinct, which leads it to delight in rural occupations.

These shouId be well attended to by the proprietors of farms, as their advantages, as well as that of their tenants, may be greatly promoted by such means.

In regard to the receiving of rents where they are of different kinds, as for cottages, tithes, in the form of compositions, chief rents, quit rents, and some other lots, besides those of the farm kind, they require some attention and method, such as the fixing of different times in the farm, or different days, for the reception of each, when on a large scale, so that the exact times of attendance for each may be known to those who have anything to settle. So far as farm rents are concerned, the fixing of proper periods for receiving them is of great importance, though the matter has hitherto been little attended to, there being often no fixed time known to the holders, until signified by the precept of the receiver. And that is, in many cases, liable to alteration. This is very inconvenient to the farmers in many instances, as they must either sell their corn and live-flock to great disadvantage, many times, before it was necessary, and have large sums of money lying uselessly by them, or meet the receiver, perhaps, with only part of the rent. The propriety and necessity of having certain exact times for receiving rents are therefore evident, and, of course, the most suitable times for these are to be ascertained, as whatever enables the holders of land to turn their produce to the most advantage, increases the prosperity of the farms, and ultimately benefits the proprietor.

In this country it is said, by the author of the work on Landed Property, farm rents mostly become due at Lady-day and Michaelmas. But the proper times of paying them depend on the marketable produce of the land, and the feacon of the year at which it goes, and can be beld fold in the markets. The holders of farms should never be forced to improper regulations in these respects, or be suffered to withhold the payment of their rents when they have obtained the money for their produce.

Upon corn farms, which are numerous in most parts of this country, Michaelmas is the most improper time in the whole year to call upon tenants for their rents. It is at the close of the harvest, as the situation may be, when the pockets are drained by extra expensive labour, and when the grain cannot be threshed out to replenish them; also when much of the off-going live-flock is not ready for the market.

In the county of Norfolk the above writer paid great attention to this matter, and found that there, the latter end of February, or beginning of the succeeding month, was the most proper season for Michaelmas farm rents to be paid; and the month of June for those of Lady-day. And, by correct examinations, those most proper in other places may be found, keeping the above principles constantly in view. Farmers should never be obliged to do anything improper in the disposal of their articles at unsuitable seasons or markets, or to raise money in any improper ways; nor be led into speculations with money while it lies idly by them.

The best seasons having been ascertained, the exact periods are to be fixed on, from the particular nature of the farms, the contents of the districts in respect to fairs and the dealers in different sorts of produce, which may generally be readily managed without much difficulty.

**Rent Accounts**, such as are kept on estates, whether of farms, cottages, chief rents, or any other sorts of annual payments, by the managers. They should be clear and comprehensive, containing every thing of importance about them, as their different circumstances may direct.

The management of the farms, in rent accounts, whether yearly or half yearly, must be the same as in the receiving rentals, as they appear on the general map; and as they naturally lie on the face of the estate, according to the ideas of the writer of the work on Landed Property. See Map of Estates.

The parishes, or manors, lying wholly or partially within the estate, are to be first geographically arranged, and then the farms on the same principle as they lie within the respective parishes. In this way it is constantly the same, and has the advantage of not being liable to be disturbed by changes of any sort, which affords much facility and convenience in all such accounts on many occasions.

**Rent Charges**, the fixed payments to which an estate or farm is subject to, such as chief rents, quit rents, annuities, endowments, schoolmasters' salaries, charitable donations, &c.

**Rent Days**, the particular days or times when the rents of estates or farms become due. They should, in all cases, be exactly and properly fixed as to season and other circumstances. See Rent.

**Rent Roll**, a general statement of the gross annual income of an estate, or receivership, whether it arises from farms, woods, lands, quarries, cottages, or any other similar things; or from tithes, quit rents, or any other sort of rents, &c.

In forming rent-rolls, this sort of general view of income is best arranged, according to the writer of the work on Landed Property, in columns, as being the most plain and perpicious; and for a schedule of farms, the following heads are proper. First, the numerals identifying the several farms in the general map. Secondly, the names of the farms. Thirdly, the contents or description of each. Fourthly, the names of the present holders. Fifthly, the amount of the existing rents. Sixthly, the amount of the outgoings, if any payable by the proprietor. And, seventhly, the expiration of the terms, if any. The farms should be arranged according to their situations.

In the receiving of rentals, they are the particulars. These few where the rents are regularly paid, the farms under proper management, and the holders pay the taxes and repairs. But it may be necessary to fix in the receiver, at one view, the name of the farm, and the name of the holder, as well as the amount of his half year's rent.
REN

English merchant, who, sending a piece of cloth damaged in one spot, to his correspondent at Paris, put a piece of gold in the damaged place, to make up the damage. But as this example is perhaps the only one of its kind, that author recommends it to the merchant, or draper, to unfold all the pieces entirely, as they come to him; to discover the fine-drawings, and other flaws, in order to make the clothier accountable for them.

RENTERSHAUSEN, in Geography, a town of the duchy of Wurzburg; 7 miles E. of Lauringen.

RENTOWN, a town of Scotland, in Dumbartonshire, considerable for its manufactures; 5 miles W. of Dumbarton.

RENTRÉE, Fr. in Music, a return to the subject of a musical composition, after a pause, or some excursion or deviation from the theme; or in a fugue, an imitation of some particular passage or design.

RENTY, in Geography, a town of France, in the department of the rãis of Calais, on the Aa; 9 miles S.S.W. of St. Omer.

RENTZ, a town of the island of Rugen; 11 miles S.S.W. of Bergen.

RENUENTES, in Anatomy, a pair of muscles of the head, thus called as being antagonists to the annuentes; and serving to throw the head backward, with an air of refusals. From their situation they are also called rectus capitis, major et minor.

REVERSE', Fr. in Music. With respect to intervals inverted, this term is opposed to direct. (See Direct.) With respect to chords, it is opposed to fundamental; which see.

REVERSE', inverted, in Heraldry, is when any thing is set with the head downward, or contrary to its natural way of standing; thus, a chevron renversé is a chevron with the point downwards.

The same term they also use when a beast is laid on its back.

REVERSED VOLTE. See Volte.

REVERSESMENT, Fr. in Music, an invention in the order of sounds which compose the chords, and in the parts which constitute the harmony: which is done by substituting, by octaves, treble notes for the base, and base notes for the treble. It is certain that every common chord has a fundamental and natural order pointed out by the harmonics of a single firing, a great bell, or organ pipe. (See Harmonics, and Resonance.) But the circumstances of the succession, tafle, expression, feeling of notes for melody, variety, approximation of the harmony, frequently oblige a composer to change this order, by inverting the chords, and consequently the disposition of the parts. As any three things may be arranged in fix different ways, and four things in twenty-four ways, it seems at first as if a common chord was susceptible of fix changes, and an accompanied discord of twenty-four; as the one is composed of three sounds, and the other of four; and that the invention only confinits in the transposition of octaves. But it must be remembered, that in harmony a change in the upper parts is not regarded as an invention, provided the base or fundamental sound remains the lowest. Thus, these two orders of sounds, C e. g. or C e. g. are not regarded as inventions of the harmony. And in the chord of the 7th no change in the upper parts constitutes an invention.

As long as the fundamental sound is the lowest part, the order is direct. But when this order is changed, or the fundamental sound is given by transposition to one of the upper parts, the harmony is inverted. In whatever part a discord is prepared, it must be resolved by the same part; a sharp
To Repair a Medal, is to retouch it; so as, from rusty and defaced as it was, to render it clean, neat, and perfect. In order to this, they take off the rust with a graver, touch up the letters, polish the ground, and raise and restore the figures which before were sometimes scarcely seen. When the figures are eroded or broken, they fit a piece of cement on the spot; and on this cut with a graver fo dexterously, that the figures appear entire, and well kept; yet nothing spoils medals so much as repairing them. See Medal.

To Repair a Ship, is to amend any injuries, or supply any deficiencies, which a ship may have received by age, battle, tempestuous weather, &c. The repair is necessarily greater or smaller in proportion to the loss or damage the vessel has sustained. Accordingly a suitable number of the timbers, beams, or planks, or a sufficient part of either are removed, and new pieces fixed in their places. The whole is completed by bremming, calking, and paying the body with a new composition of stuff.

REPAIRERS, artificers who chase figures and beautify sword-hilts, &c.

REPAIRING, in Building, &c. See Reparation, and Restoration.

The repairing of large walls, doors, ceilings, coverings, &c. belongs to the proprietor or landlord: the tenant is only charged with small repairs, as glafs windows, locks, &c. by the French called locative repairs.

REPAIRS, in Hunting, are the haunts and places which the hare runs to.

Repairs of Farm Buildings, in Rural Economy, the necessary means of putting and keeping them in proper order. This properly belongs to different sorts of workmen, as masons, carpenters, &c. It is a bad practice to let buildings of this nature fall much into decay, as by such neglect a great deal of expense is frequently incurred that might otherwise have been avoided. See Farm-Buildings.

REPANDUM FOLIUM, in Botany, a leaf whose outline is undulating, without the surface, or fibritance, being otherwise than even. See Leaf, where, for nepheoides, read nymphaoides.

REPARANDIS PONTIBUS. See Pontibus.

REPARATION, Reparatio, the act of repairing, re-establishing, retrieving, or mending a building, or other work, damaged, or gone to decay.

The enemy repaired the breach as soon as it was made. The establishment of turnpikes is for repairing of the roads. An ecclesiastical patron is by ancient custom obliged to repair the choir or chancel of a church, and the parishioners the nave.

REPARATIONE FACIENDA, in Law, is a writ which lies in divers cafes, &c. where there are tenants in common, or joint tenants of a house, &c. which is fallen to decay, and the one being willing to repair it, the other two will not; in this case, the party willing shall have this writ against the other two.

REPARO, in Geography, a small island near the coast of Brazil. 8. lat. 29° 23'.

REPART, in the Manse, is to put a horfe on, or make him part a second time.

REPARTEE. See Repartie.

REPARTITION, Repartitio, a dividing or sharing a thing a second time.

REPARTY, or Repartee, a ready, smart reply: especially in matters of wit, humour, or raillery.

The word in the original French, partie, has the same signification.

Wicquefort observes, that there is a great difference between
between a free, slyrithly repartly, and an offensive sarcasm; which see.

REPAST, REPASTUM, a meal or refrection, taken at a flated hour.

In old law-books repast is particularly used for a meal's meat given to servile tenants, while at work for their lord.

The French call their meal repas; the Latins, pastus; the Italians and Spaniards, pasto.

In antiquity the repasts were frequently sacrifices; for which reason we find them often prepared by kings themselves.

REPEALING, in Law, the revoking or annulling of a statute, deed, or the like. See ABROGATION, REVOCATION, &c.

No act of parliament shall be repealed in the fame feffion it was made in. A deed or will may be repealed for a part, and stand good for the reft.

Brook uses the word repellance in the fame fenfe.

REPEAT, in Music, a character shewing that what was last played or sung must be repeated, or gone over again.

The repeat serves instead of writing the fame thing twice over. There are two kinds of repeats; the great and the small.

The great repeat is only a double bar, dotted on each fide; or two parallel lines drawn perpendicular across the staff; with dots on either hand. See its form under Characters of Music.

This mark shews, that the preceding strain is to be repeated; that is, if it be near the beginning of the piece, all hitherto sung or played is to be repeated; or, if towards the end of a piece, all from such another mark.

In gavots, we usually find the repeat at about the third part of a piece; in minuets, bores, courants, &c. towards the end.

Some make this a rule, that if there be dots on each fide the bar, they direct to a repetition both of the preceding and the following strain; if there be only dots on the fide, then only the strain on that fide is to be repeated.

The small repeat, is where only some of the laft measures of a strain are to be repeated: this is denoted by a character fet over the place where the repetition begins (see Characters, in Music), and continues to the end of the ftrain.

When the fong ends with a repetition of the firft ftrain, or part of it, instead of a repeat, they use the word da capo, i.e. from the beginning.

REPEATING CIRCLE, an instrument used in Navigation, Astronomy, and Surveying. This instrument derives its name from the property it has of giving the average of several repeated measures of an angle, made round the whole circle, so as to diminish the errors of division and of eccentricity; which is a very useful property, where the art of dividing is not brought to that perfection which it is in England. When the lunar method of determining the longitude, by the help of improved tables of the moon's motion, was proposed to be put in practice, Mayer offered a construction of the circle, which, by repeating the measure of a lunar distance, promised to increafe the accuracy with which such distance could be measured; and after him, Borda went a step farther towards the attainment of the desired object, both whose contrivances we have described under our article CIRCLE. Thefe instruments, like Hadley's octants, measured the angles by reftection, and were consequently used at sea; but the principle of repetition is not confined to reflecting instruments; and Borda constructed, or contrived the construction of, a repeating circle, which will measure either vertical or horizontal angles without reftection, with a degree of accuracy that has placed it high in the estimation of the French, among whom accurate dividing is yet a desideratum. This instrument we have already described, and likewise Troughton's improvement on it, in the article already referred to.

But the repeating principle was extended by Joseph de Mendoza Rios in the reflecting circle, fo as to measure both backwards and forwards, and to give double results by means of a moveable or flying circle, which we have likewise descibed under the article CIRCLE, together with our observations on the peculiarities of its construction. It remains, therefore, that we now describe a recent construction of a reflecting and repeating circle, contrived by profeflor Hafsler of Philadelphia, who is a native of Switzerland, and who has refided feveral months in London, for the purpofe of collecting fuperior astronomical and furveying instruments, at the expense of the American government. The object of this ingenious foreigner was to unite the repeating principle of Borda, with the firm construction of Troughton's reflecting circle, fo that his new instrument might be free from the objections of the repeating circles that preceded it, arifing from fhallof centre-work, and clamping after the contact were made in an obfervation; and in the construction he has adopted, by the aid of Troughton, he has rendered his instrument free from thefe objections, and given it every advantage which its original contriver contemplated: we cannot, however, admit, that in practice it is superior in accuracy, and certainly not in fimplicity, to Troughton's reflecting circle, which we have before described, as giving the average of fix readings at two operations, in inverted positions, at the different fides of zero on the fixed circle. The union of Borda's and Troughton's constructions is thus affected by Hafsler; the circular border of Troughton's instrument is made moveable round the centre, like his three armed verniers, and is graduated like his, while a pair of opposite verniers move round the fame centre, above the plane of the moveable or flying circle, having a clamping apparatus for flow motion at one of the two opposite verniers, fo that the pair of verniers may be made to revolve with or without the graduated flying circle; another pair of verniers, similar to the former, and having also a clamping apparatus for flow motion, are made falt to the frame, and have the extreme ends of their connefting diametrical bar united by a graduated femicircle, that lies under the flying circle, and is hid thereby when the graduated face of the circle is uppermoft: the use of this femicircle is to receive a pair of thin BAD pieces of brass that act as foows to the indices, when they were properly placed at the rough angle, to the right and left of zero on the flying circle, by a previous operation; fo that, when the bar of the verniers comes in contact with either of thefe foows, it is known, even in the dark, that the place where a contact is to be made is nearly ascertained, and the vernier-bar may be made falt, for the fcerw of flow motion to be brought into action to complete the contact. The principle on which the measurement is effected is this: the revolving verniers move forward from zero of the graduated circle, when the foows are previously fet to the rough angle, till the index or vernier-bar touches the fwo to the left, when the graduated face is uppermoft, and is clamped to the fixed verniers; the clamping apparatus then fixes the verniers, and the tangent-screw completes the contact; the two revolving verniers might now give the angle, by two readings, but the repeating principle has not yet been introduced, and consequently no advantage is yet derived from this first obfervation, over a common circle with a double vernier; the fixed verniers are in the next place unclamped, but as they have no motion, the flying circle and revolving verniers are brought back to the right together, across the point zero, till
till the vernier-bar touches the second flop, and during this
motion, the revolving verniers have moved backwards and
double the rough distance with the attached circle, that they
did forwards before without it; consequently the fixed
verniers will now read the same angle at the right of zero, that
the revolving verniers did on the left, when the clamping is
again made and the contact completed; but still this is only
a second mode of reading a single measure of the angle,
and nearly all that is yet gained in accuracy, is the exter-
mation of the index error, and that of the dark glafs, if
used; these errors having been alternately positive and nega-
tive, if any existed. These two measures, separately read,
are equivalent to Borda's croffed obfervation, as he calls it,
because the motion of the vernier-bar crofses the point zero
in his fixed circle; here it is prefumed that the two objects,
that include the angle, are equally luminous; but if not, it
will be neceflary to invert the face of the instrument before
each second, fourth, fifth, &c. contact, and then the
movings will all be forward, or from right to left, which other-
wise would be alternate: the second reading, however, may
be omitted; the revolving verniers, being unclamped, must
be moved again to the first flop in the original position,
where, the contact being complete, they will give a double
measure if examined; but the readings are yet omitted: the
fixed verniers are now unclamped, the instrument again
inverted, and the contact completed, when these verniers, if
examined, will also give double measures; and thus treble
and quadruple measures must be had successively at both the
revolving and fixed verniers, or even more, if the circle has
not been passed over by each pair of verniers, before the
readings are required to be examined, and then the average
of all the measures by the fixed verniers, added to an aver-
age of all the measures by the revolving verniers, will
afford the means of getting an average of the whole number
of measures.

From this description of Hafsfier's mode of applying the
repeating principle, it will be obvious to the reader, that
the diametrical bars of the two pair of verniers must not be
to contiguous to each other, when the glafes called the horizon-
glafs and index-glafs are parallel; and accordingly we find,
on examining an instrument of this construction, that these bars
crofs one another at right angles before the operations begin;
but as there is but one zero in the circle, one pair of the
verniers must necessarily begin at 90°, when the other pair
begins at 0°; consequently ninety degrees must be deducted
from the sum of the measures of this pair before their aver-
age is taken: otherwise, if neither pair of the verniers begin
at zero, the two numbers from which they respectively com-
 menced must both be deducted before the averages are taken,
in which case it will be of no importance at what part of the
flying circle the operations begin. Should the reader
find any difficulty in comprehending this description of
Hafsfier's repeating circle, without a reference to a drawing,
we recommend that he refer to our account of reflecting cir-
cles, decribed under the article CIRCLE, where he will find
the account of the two separate instruments of which this
forms an union; and at the same time will fee how it differs
from Mendoza's, which gives double results.

By way of illustrating the use of Hafsfier's repeating cir-
cle, we will suppose that some known star is to the east or
west of the moon, and that the longitude of the place of
obervation is required from an actual measurement of the
distance of the fixed star from the moon's limb, when com-
pared with its computed distance as given for a certain hour
on the same evening at Greenwich, in the Nautical Almanac:
we will suppose the glafes of the circle adjusted, and the
small telescope screwed into its socket, and so adjusted both
for dimift vision, and comparative brightnefs of both objects,
that the star can be brought to touch the moon's limb, and
have a neceflary contact; in the first place, hold the plane of
the circle in such an inclined position that it may pass
through both objects, and get the star into the field of view,
while the revolving verniers are at zero, and the fixed ones
clamped at 90°; in the next place, move the revolving verniers
with an equable motion, and let the eye follow the
star, or rather the image of it, till it comes to the edge of the
moon, which it may be made to approach by a proper motion
of the body; then clamp the index there till the flop is put
on the semicircle very nearly to touch the edge of the index,
where it must remain: the second flop must also be put to
the same divifion on the semicircle at the other side of its
zero, provided this zero be co-incident with the zero of the
circle; or, which is the fame thing, the distance between
the flops must be somewhat more than double the angle
to be meafured; the contact may now be completed by
the tangent-screw; let the fixed verniers be unclamped, and
the released circle and revolving verniers be made to recede to-
together till the second flop gives them a check, there they must
be clamped and the circle inverted, when the star will again be
seen nearly in contact, which must now be made entirely fo
by the screw of slow motion; in the next place the move-
able verniers, being first unclamped, must be carried again
to the first flop and clamped, to make the contact as before,
after the inversion of the circle has again taken place; and
in this manner the revolving verniers must be moved to the
first flop, and the verniers and circle together to the sec-
ond flop, before each inversion and contact, till five, six,
seven, or more alternate operations have been gone through,
and the whole circle has been travelled over, which may
always be known from the position of the flops. The ex-
act times must be noted at the beginning and end of these
operations, which by an expert obferver will be gone
through in a few minutes, and the mean time will be
bad of the moment correffponding to the mean of the re-
peated obervations: at these times the affifants must also
take each their two altitudes. Say now that the flops
were required to be nearly at 40° at each fide of zero of
the semicircle, or that the distance between them was 80°,
within a few minutes over, and that there were nine ob-
ervations thus made with the revolving verniers, and
eight with the fixed ones, which numbers fuppose the firft
and laft meafures to be taken with the fame pair of verniers,
or with the fame faced of the circle uppermost; fay alfo,
that the final readings by this pair of verniers were repre-
sently 1° 10' 20", and 181° 10' 0", or rather 361° 10' 20", and
541° 10' 0", becaufe these verniers completed the entire cir-
cle; then if we diminish the latter reading by 180°,
its distance before the other, we fhall have 361° 10' 0", and
the average of the pair of opposite verniers will be
361° 10' 10", which quantity divided by 9, the number of
meafures taken by them, will give a quotient of 40° 7' 8.9.
for the firft average of the distanee, refulting from the op-
eration of the revolving verniers alone; again, let the final
readings of the fixed verniers be repreffently 50° 37' 20" and
250° 57' 30"; but if we increafe the firft reading by 360°,
we fhall have 410° 57' 20", which must be diminifhed by 90°, becaufe it started from this number, and the
remainder will be the correct reading, namely 320° 57' 24";
also 250° 57' 30" increased by 360° is 590° 57' 30"; and this number diminifhed firft by 90°, as before, and
then by 180°, the diftanee by which it precedes its fel-
low-vernier, will be 320° 57' 30", and confequently the
average of the two final readings of the fixed verniers will be
320° 57' 25", which sum divided by 8, the number of re-
peated
Repeated measures in the inverted position, will give a quotient of \(40^\circ 7^\circ 10^\circ 6^\circ\) for the distance averaged by the fixed verniers; and lastly \(\frac{40^\circ 7^\circ 8^\circ 9 + 40^\circ 7^\circ 10^\circ 6^\circ}{2} = 40^\circ 7^\circ 9^\circ 75^\circ\), the exact apparent distance, which may be converted into the true distance by any of the methods used for clearing it of the joint effect of parallax and refraction. See Longitude, and Lunar Observations.

Repeating Mechanism, in Horology, is a mechanical contrivance that, when acted on by a pull or push, will make the striking part of a clock or watch repeat the hours and quarters of existing time, so that a person in the dark, or even in bed, may know within a quarter of an hour what it is o'clock, as well by night as by day. The first contriver of the repeating mechanism of a clock was Barlow, a London clock-maker, who in the year 1676 produced to the world his specimen of ingenuity, which astonished all the admirers of the mechanical arts, and excited in others a desire to vary the construction, with a view to the improvement of the original contrivance; and the consequence has been, that Quare, Tompion, and others in London, as well as after them Julien le Roy, Thioun, Collier, Largay, Berthoud, &c. on the continent, have given many different kinds of repetition, for both clocks and watches, that a particular description of each construction would require several plates, and a whole volume to give the details. Under our article Clock we have already explained at considerable length the particulars of the repeating mechanism of two several clocks, as it is constructed at this time, from which the reader will see how the acting parts may be varied in many ways to answer the same purpose; but in most of the modern contrivances the rack and the pinion constitute the basis of the plan, and regulate the action of all the metallic parts employed. For the repeating mechanism of a watch, see our article Watch.

Repellent Medicines, are those which prevent such an influx of fluids to any part as would excite humour or inflammation, or which tend to diminish such an influx, when it is already produced. Medicines of this quality are principally refrigerants and astringents, especially the former. The most effectual repellent is cold; and those applications, therefore, which most effectually obstruct the heat, are the most efficacious repellents; and many of the drugs, which are applied in combination with cold liquids, are of little value; the cold menstruum, that is the water, being the principal agent in the curative process.

Repelling Power, vis repellens, in Physics, is a certain power or faculty residing in or exerted by the minute particles of natural bodies, by which, under certain circumstances, they mutually fly from each other.

This power is the reverse of the attractive power. Sir Isaac Newton having established the attractive power of matter from observation and experiment, argues, that, as in algebra, where positive quantities exclaim, there negative ones commence; so in physics, where the attractive force ceases, there a repelling force must begin; and adds, that there is such a force, does likewise appear from observation.

As the repelling power seems to arise from the same principle as the attractive, only exercised under different circumstances, it is governed by the same laws; now the attractive, we find, is stronger in small bodies than in great ones, in proportion to the masses; therefore the repelling is so too. But the rays of light are of all others the most minute bodies we know of; therefore, of all others, their repelling force must be the greatest.

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Sir Isaac Newton computes, that the attractive force of the rays of light is above \(10000000000000\) times as strong as the force of gravity on the surface of the earth; hence arises that inconceivable velocity with which light (if it consist of real particles) must move, to reach from the sun to our earth in seven minutes. For the rays emitted from the body of the sun by the vibrating motion of its parts are no sooner got without the sphere of attraction of the sun than they come within the action of the repelling power.

The elasticity or springiness of bodies, or that property by which, after having their figure altered by an external force, they return to their former figure, follows from the repelling power. See Repulsion.

Repentance, in Theology, is a change of sentiments followed by a change of conduct; or repentance denotes such a conviction of the evil and danger of a sinful course, as is sufficient to produce shame and sorrow in the review of it, and effectual resolutions of amendment. This definition expresses the sense of the two words \(\text{Miserere} \) and \(\text{Miserere} \), which are commonly used by the evangelical writers to signify repentance.

REPENTIGNY, in Geography, a town of Canada, on the river St. Lawrence. N. lat. 45° 48'. W. long. 73° 15'.

Repercussion, in Mechanics. See Reflection. Repercussion, in Music, iteration, a repetition of the same note or sound.

This often happens in the modulation, where the effential chords of each mode, or of the harmonical triads, are to be struck often than the rest; and of these three chords, the two extremes, i.e. the final and the predominant one, (which are properly the repercussions of each mode) oftener than the middle one.

Repersed, in Geography, a town of the duchy of Wurzburg; 7 miles S.E. of Wurzburg.

Repertory, Repertorium, a place in which things are orderly disposed, so as to be easily found when wanted. The indices of books are repertories, shewing where the matters sought for are treated of. Common-places are a kind of repertories, very useful to the learned.

Repertorium Anatomicum, denotes a large hall near an amphitheatre of dissectors, where skeletons, both human and brutal, are orderly preferred. Such is the repertory in the French king's garden at Paris.

Repentend, in Arithmetic, is used for that part of an indeterminate or infinite decimal fraction, which is continually repeated ad infinitum.

Thus, in the indeterminate decimal fraction \(0.31745316 \ldots\), the figures \(316\ldots\) are called the repetend.

These repetends often arise in the reduction of vulgar fractions to decimals, thus \(\frac{1}{3} = 0.3333\ldots\) and \(\frac{1}{7} = 0.142857142857142857\ldots\).

Decimals of this kind are called repeating or circulating decimals, (which see) on account of this continual repetition or circulation of the same figures. Infinite decimals are of two kinds, which may be distinguished by the general denominations of certain and uncertain. A general infinite decimal is such whose numerator runs into infinity by a continual repetition of one or more figures, as \(0.44\ldots\), and uncertain decimals are such, whose numerator goes on for ever without a confluent circulation of figures. The essential difference between these two kinds is this; that the certain infinite decimals have a determinate, finite, and certain value, in that there is a certain determinate vulgar fraction, which expresses the true and complete value of that infinite decimal, whereas the uncertain have no such finite and assignable value: and hence the reason of the names.
Repetend, Single, is that where only one figure is repeated, as in $\frac{3}{3}$,

Repetend, Compound, is that where two or more figures are repeated, as in $\frac{0.09}{0.09}$, &c., or in $\frac{142857}{142857}$, &c.

Decimals with repetends may always be reduced to vulgar fractions; for either the repetend begins with the decimal, or not.

If the repetend begins with the first place of decimals, or if the decimal is a pure circulate, make it the numerator of a vulgar fraction, and make the denominator consist of as many $9$'s as the repetend has figures; or if there be cyphers between the point and repetend, with as many cyphers to the right hand of the denominator, then will this vulgar fraction be equal to the decimal.

Thus, if the repetend be single, as in $\frac{3}{3}$, the vulgar fraction equal to it will be $\frac{3}{9} = \frac{1}{3}$. So if the repetend be compound, as in $\frac{0.09}{0.09}$, &c., the equivalent vulgar fraction will be $\frac{\overset{\bullet}{0}0}{\overset{\bullet}{0}0} = \frac{\overset{\bullet}{9}}{9} = \frac{1}{9}$.

And in like manner $\frac{142857}{142857}$, &c. $= \frac{142857}{142857} = \frac{1}{9}$.

The reason is obvious from this consideration, that the decimal $\frac{3}{3}$, &c. $= \frac{3}{9}$, &c. $= \frac{\overset{\bullet}{3}}{3}$, &c., the sum of which will be equal to $\frac{3}{3}$ divided by $1 - \frac{\overset{\bullet}{3}}{3} = \frac{3}{9} = \frac{1}{3}$; and so of the rest.

If the repetend does not begin with the first place of decimals, but at some place farther on towards the right, or if it be a mixed circulate, as in the decimal $\frac{8}{3}3\overset{\bullet}{3}$, &c., where the repetend does not begin till the second place of decimals, observe, that $\frac{8}{3}3\overset{\bullet}{3}$, &c. $= \frac{8}{3}3\overset{\bullet}{3}$, &c. $= \frac{\overset{\bullet}{3}3}{\overset{\bullet}{3}3}$, &c. $= \frac{3}{9} + \frac{\overset{\bullet}{3}3}{\overset{\bullet}{3}3}$, &c. $= \frac{3}{9} + \frac{\overset{\bullet}{3}3}{\overset{\bullet}{3}3}$. But $\frac{3}{9} + \frac{\overset{\bullet}{3}3}{\overset{\bullet}{3}3} = \frac{9}{9} = \frac{3}{9}$, before: therefore the proposed decimal is $\frac{3}{9} + \frac{\overset{\bullet}{3}3}{\overset{\bullet}{3}3}$, which is, as before, $\frac{3}{9}$.

Thus also if the decimal $\frac{27}{27}$, &c., were proposed, we shall find it $\frac{27}{27} + \frac{\overset{\bullet}{2}7}{\overset{\bullet}{2}7}$, &c. $= \frac{27}{27} + \frac{\overset{\bullet}{2}7}{\overset{\bullet}{2}7}$, &c. $= \frac{27}{27} + \frac{\overset{\bullet}{2}7}{\overset{\bullet}{2}7} = \frac{30}{30} = \frac{1}{9}$. The reason of which is obvious from what has been said.

It may, perhaps, be worth while to observe, that if the numerator of a vulgar fraction be unity, and the denominator any prime number, except 2 and 5; the decimal equal to the proposed fraction will always be a repetend, beginning at the first place of decimals; and this repetend must necessarily be a submultiple, or an aliquot part of a number expressed by as many nines as the repetend has figures; that is, if the repetend have six figures, it will be a submultiple of 999999; if four figures, it will be a submultiple of 9999; &c. From whence it follows, that if any prime number be called $p$, the series 9999, &c. produced as far as is necessary, will always be divisible by $p$, and the quotient will be the repetend of the decimal fraction $\frac{1}{p}$. For the management of decimals of this kind, see Malcolm's Arithmetic, book v. chap. 4.

REPETITION, Repetitio, the reiterating of an action. See Reiteration.

Habits are acquired by the frequent repetition of actions. School-philosophers call the repetition of the same numerical effect, in another place, the replication of that effect.

REPETITION. The French make use of this word for a rehearsal, which the italians call a prova. "Rehearsals (says Roufseau) are necessary for compositions that are to be performed in public, in order to prove whether the several parts are correctly copied, and for ascertaining the entrances and the exits of the several characters, as well as to see that they feize the spirit of their parts, and of the entire drama. Rehearsals are likewise of use even to the composer himself, to enable him to judge of effects, and to make such changes as may seem necessary." Repetition, in Muses, denotes a repetition or playing over again the same part of a composition, whether it be a whole strain, or part of a strain, or a double strain. The repetition is denoted by a character called a repeat; which is varied so as to express the various circumstances of the repetition.

REPETITION, Reply, is also used when, after a little silence, one part repeats or runs over the same notes, the same intervals, the same motions; in a word, the same song, which a first part had already gone over during the silence of this.

REPETITION, Reply, is also a doubling or trebling, &c. of an interval, or reiteration of some concord or discord. Thus, a fifteenth is a repetition of the octave, i.e. a double octave, or second octave.

REPETITION of Poesy. See Rosalia.

REPETITION, in Rhetoric, is a figure by which the orator rehearses the same words or phrases over again.

Of this there are two kinds. In the first, the word is repeated precisely in the same sense: as, Ob, Jerufalem, Jerufalem, who kill'd the prophets, &c. My God, my God, why hast thou forsaken me?

Such repetitions have the same effect in discourse, with second strokes of the pencil in painting; they render the colours more strong and lively.

Sometimes the orator begins again and again with the same word, of which we have an instance in the beginning of Cicero's first oration against Catiline: Nihil obstat, nunc in praefexit populus, nihil urbis dignitas, nihil tumultus urbium annus, nihil his munitibus habendus fructus locum, nihil horum ara vulnificus moverat. Where the word nihil to often reiterated gives an admirable force and vehemence to the discourse. Again, the same author: Quem senatus damnatus, quem populus R. damnatus, quem omnium extorquor damnatus, cum vos furentiis refertis obvictis? Again, Non fiam, non patria, non frater.

The second kind of repetition, called "motto, place, (which see,) is a repetition of the same word in the same phrase; but in such a manner, as that some new idea or character is added to the word in the second, which it had not in the first.

As, Corydon is always Corydon: Ex illa Corydon Corydon est tempore nobis; by which we signify, that Corydon is no ordinary person; and that nothing can dislinguish him but the repetition of his own name: as if we should say, he is Corydon, that is enough. By the same figure our Saviour speaks, when he says: Let your language be yes, and no; may, may. See Recapitulation.

REPETITUM, or Vettium Namium, in Law. See Namium.

REPHAM, or Reepham, in Geography, a market-town and parish in the hundred of Eynsford, and county of Norfolk, England, is situated at the distance of 13 miles N.W. by N. from Norwich, and 112 N.E. by N. from London. The charter for its market, which is held on Saturday weekly, was obtained by Sir John de Vaux, in the fifth year of the reign of King Edward V. An annual fair, on the 29th of June, was granted at the same time. At one period this parish was remarkable for having three churches situated within one sepulchral inclosure; viz. Reepham, Whitwell, and Hackford; but only two of these are now standing.
The church of Reepham serves also for the village of Ker
dleton, which belongs to the same lords. In this edifice was
formerly a "famous image of the Virgin Mary," which, like
the shrine of Diana at Ephesus, was productive of no small
gains to its pellellars; numerous pilgrimages have been
made to it by persons of rank and influence. Here are
different monuments to the memory of different branches of
the Kerdelton family. One of them, placed against the north
wall of the chancel, bears the figure of a knight templar
in armour, with his hands and legs crost. It has no in-
scription, but is traditionally said to have been raised in ho-
nour of Sir Fulke de Kerdelton, who died in 1270. Blome-
field's History, &c. of Norfolk. Beauties of England and
Wales, vol. xi. by John Britton, F.S.A.

REPIN, a river of Poland, which runs into the Dnieper,

near Kiev.

REPELTZ, or Ropitz, a town of Saxony, in the mar-
grave of Meillen; 2 miles N. of Torgau.

REPLANTING, in Gardening, the act of planting a
second time.

The gardeners used to displant their tulips every year,
and replant them. Lettuces must be displanted and re-
planted yearly, to make them head and nut. If strawber-
ries, &c. be not displanted and replanted once in a few years,
they degenerate.

REPLEADER, REPLACITARE, in Law, is to plead
over again what was once pleaded before.

If, by the misconduct or inadvertence of the pleaders, the
issue be joined on a fact totally immaterial, or insufficient
to determine the right, so that the court upon the finding
cannot know for whom judgment ought to be given, the
court will after verdict award a replacer, quod partes re-
placient; unless it appears from the whole record that
nothing material can possibly be pleaded in any shape what-
soever, and then a replacer would be fruitless. (4 Bur.
301, 302.) And whenever a replacer is granted, the plead-
ings must begin de novo at that stage of them, whether it be
the plea, replication, or rejoinder, &c. in which there ap-
pears to have been the first defect, or deviation, from the
regular course. Raym. 453. Salk. 570.

REPLEGINDO Homine, Writ de. See HOMINE.

REPLEGIARE de Aeris, a writ brought by one
who has cattle distrained, and put in a pound, by another;
upon securiy given the sheriff to pursue, or answer the action
at law against the distrainer.

REPLETION, in the Canon Law, is where the revenue
of a benefice or benefices is sufficient to fill or occupy the
whole right or title of the graduate who holds them.

When there is a repletion, the party can demand no more
by virtue of his degrees. In England, where benefices are
not appropriated to degrees, repletion, strictly speaking, has
no place.

In France, by the old constitution, 600 livres, or 45l.
per annum, made a repletion, when the benefice was
obtained otherwise than by a degree; and 30l. per annum,
when it was obtained by virtue of a degree.

REPLETION, in Medicine, sometimes signifies the general
fulness of the habit, which is called plethora; and sometimes
the temporary overloading of the stomach with food and
drink, which occasions particular attacks of disease, such as
a fit of apoplexy, or of the gout, or a diarrhae.

REPLEVIN, PLEVIN, in Law, a remedy granted on
a diltress; being a re-delivery of the goods distrained to
the first pellellor, on securiy or pledges given by him to
try the right with the distrainer, and answer him in the
courte of law.

If a perfon distrain another's goods or cattle for rent, or
damage feasant, &c. the owner, upon giving securiy to the
sheriff, that he will prosecute his action against the party
distraining, and return the goods or cattle again if the seiz-
ure shall be adjudged good, may have a writ of repliex, or
replegiar facias. See DISTRESS and REPLIEX, infra.

REPLEVISH, is to let one to mainpeine upon surety.

See MAINPREISE.

REPLEVY, REPLIVIS, (from the Latin replicare, to
re-deliver to the owner upon pledges of surety,) is the
bringing of a writ of repliex, or replegiar facias, filing
out of chancery, by him whose goods cattle or goods are distrained
by another upon any cause; having first given security to
the sheriff, that, on the delivery of the thing distrained,
he will prosecute the action against the person who made the
differences.

In the flat. 24. Henry VIII. we read of curis repli-
exitat, or bounds repliex, in a cafe between the abbot of
St. Alban's and Geoffrey Childwife.

Goods may be relieved two ways: viz. by writ, which
is that used by the common law; and by plaint, which
is that by statute law, for the more speedy having again
the cattle and goods; and is brought in the sheriff's
courte.

Accordingly, the statute of Marlbridge (52 Hen. III.
cap. 21.) directs, that (without filing a writ out of chan-
cery) the sheriff, immediately upon complaint made to
him, shall proceed to replevy the goods. And, for the
greater ease of the parties, it is farther provided by statute
1 P. & M. cap. 12. that the sheriff shall make at least four
deputies in each county, for the sole purpose of making
replevis. Upon application, therefore, either to the sheriff,
or one of his said deputies, security is to be given, in pur-
suance of the statute of Westm. 2. 13 Edw. I. cap. 2.
1. That the party repleving will pursue his action against
the distrainer; for which purpose he puts in plegias de profes-
quendo, or pledges to prosecute: and, 2. That if the right be
determined against him, he will return the diltress again; for
which purpose he is also bound to find plegias de returno ba-
endo. Besides these pledges, which are merely discretion-
ary in the sheriff, the statute 11 Geo. II. cap. 19. requires
that the officer, granting a replevin on a diltress for rent, shall
take a bond with two sureties, in a sum of double the value
of the goods distrained; which bond shall be aligned to the
avouer or percon making cognizance, on requet made to
the sheriff; and, if forfeited, may be sued in the name of the
avouer. The sheriff, on receiving such security, is imme-
diately, by his officers, to cause the chattels taken in diltress
be restored into the possession of the party distrained upon;
unles the distrainer claims a property in the goods so taken.
If this be the case, the party repleving must sue out a writ de
propriate probando. But, if no claim of property be put in,
or if (upon trial) the sheriff's inquest determines it against
the distrainer, then the sheriff is to replevy the goods, if they
be found within his county. When the goods are delivered
back to the party repleving, he is then bound to bring the
action of replevin, which may be prosecuted in the county-
court; but either party may remove it to the superior courts.

REPLICATION, REPLICATIO, in Logic, the affuming
or using the same term twice in the same proposition; other-
wise called reduplicatio.

Some philosophers use the phrase repliatio wundi, repli-
action of the world, for its conversion, or turning round.
The human soul is said to be in a place replicatius, repli-
ativo, when conceived to be all in the whole, and all in
every part of it.

REPLICATION, in Law, is an exception of the second de-
gree,
gree, made by the plaintiff to the plea or first answer of the defendant.

The replication is particularly that which the plaintiff replies to the defendant's answer in chancery; and which is either general or special. The special is grounded upon matter arising out of the defendant's answer, &c. The general is so called from the general words used in it. See Repond, and Confess and avoid.

REPLIQUE, Fr. in Mufic. This term, which implies an octave, has been, not very happily, rendered into English by replicates, in the wretched translation of Rameau's treatise; but though it has been generally adopted, it has never been properly naturalized to our language. Sir Francis Bacon has used the word recurrence for the same purpose, which is much more congealent with our idiom. There is necessarily a repetition of the name found, or its octave, in every composition of four parts.

REPLOT, in Geography, one of the Quarken islands, in the gulf of Bothnia. N. lat. 65° 15'. E. long. 21° 7'.

REPOLON, in the Manue, is a demivole, the croupe in, closed at five times. The Itali ans are extremely fond of this fort of mangue. In making a demivole, they ride their horses short, so as to embrace or take in less ground, and do not make way enough every time of the demivole.

REPOLOVSKOIJ, in Geography, a town of Russia, in the government of Tobolik, on the Iriftich; 171 miles N. of Tobolik.

REPOSE, Fr. in Mufic, the answer to a subject of fugue. The answer to a fugue, and the time when it is to be introduced, are difficulties in the art of regular fugue, concerning which young contrapuntists are long doubtful. See Fuge and Counter-subject.

REPORT, the relation made upon oath, by officers or persons appointed to visit, examine, state, or elicit any thing.

Damages, repairs, &c. are judged from the reports of experienced persons. Provisions for persons wounded are only granted on the reports of surgeons, &c. in cafes of report of matrons is to be had.

REPR, in Law, is a public relation, or bringing to memory, as judiciously argued, debated, resolved, or adjudged, in any of the king's courts of justice, with the cause and reason of the same delivered by the judges. They are bilies of the several cafes, with a short summary of the proceedings, which are preferred at large in the record, the arguments on both sides, and the reasons the court gave for its judgment, taken down in short notes by persons present at the determination: these serve as indexes to, and also to explain, the records.

These reports, which in matters of consequence and nicety the judges direct to be searched, are extant in a regular series from the reign of Edward II. inclusive; and from his time to that of Henry VIII. were taken by the prothonotaries, or chief fereis of the court, at the expense of the crown, and published annually; whence they are known under the denomination of the "Year-books." And it is much to be wished (says judge Blackstone) that this beneficial custom had, under proper regulations, been continued to this day; for though king James I., at the instance of lord Bacon, appointed two reporters, with a handsome stipend, for this purpose, yet that wise institution was soon neglected; and from the reign of Henry VIII. to the present time, this task has been executed by many private and contemporary hands; who sometimes through haste and inaccuracy, sometimes through negligence and want of skill, have published very crude and imperfect (perhaps contradictory) accounts of one and the same determination. Some of the most valuable ancient reports are those published by lord chief justice Coke, which are so highly esteemed, that they are generally cited without the author's name; and are called rep. 1567, 1598, the reports. The reports of judge Coke are also cited in a particular manner, by the name of those princes in whose reigns the cafes reported in his three volumes were determined, viz. queen Elizabeth, king James, and Charles I., as well as by the number of each volume.

When the chancery, or any other court, refers the platting of some cafe, or comparing an account, &c. to a matter in chancery, or other referee, his certificate therein is also called a report.

Reports, in Military Matters, are daily, weekly, and monthly reports of the state of the companies or regiments, relative to their being present or absent, on duty, sick, confined, &c.

General officers report to the commander-in-chief only. The commander-in-chief's guard reports to himself by one of his aide-de-camps. Reports of cavalry are given in to the senior generals of cavalry; and reports of infantry to the senior general officers of infantry. On a march the field officer of the piquet reports to the general of the day who leads the column; and in camp to the next superior officer to himself. A provolt martial gives in his return of prisoners, and reports to the general of the day.

Deputy judge advocates, acting in districts or garrisons, &c. end in the minutes of courts martial, and report to the judge advocate general, without going through any general officers. Regimental surgeons report to their commanding officers, and surgeons in districts, &c. to the medical board.

The life-guard report, through the Gold Stick, to the king direct, from whom they receive the parole.

The foot-guard report, through the field officer of the day, to the king direct.

All other troops belonging to the British service, the marines excepted, who report to the admiralty, report through their several commanding officers, &c. to the adjutant-general and secretary at war, and to the commander-in-chief.

A special report is said to be made when the name of an officer is transmitted by his commander to the general of a district, independent of the regular returns; and some specific instance of misconduct is laid before him. It must be generally remembered, that every officer, on his arrival from abroad with a regiment or detachment of troops, must report himself to the governor or commanding officer of the post at which he arrives; and every officer who takes his pay for foreign service, must do the same previous to his departure.

The senior officer in each recruiting quarter reports weekly to the field officer of the district, the number and strength of the parties therein. The field officers commanding recruiting parties in districts, report to the inspector-general, to whom all returns and reports are to be transmitted by them, and not direct from the recruiting officers.

The various subordinate reports are those of a rear-guard, of a barrack-guard, of a quarter-guard, of a main-guard and its dependencies, &c. &c.

In the column of remarks which must accompany each of these reports, it is necessary, for the person who signs, to specify all casualties and extraordinary occurrences according to the particular nature of each report. The different hours at which the grand rounds, visiting rounds, and paroles went, must likewise be put down.

REPORT, Pinion of. See Pinion.

REPOS, Fr. in Mufic, a repose, or pause. It is the termi-
termination of a phrase or period. The repose here meant
refrains a hyatus in verification; it is a cadence more or
less perfect as the base falls a third, a fifth, or rises to the
third of the key. It is a kind of resting place, determined
by the fence of the passage, and by feeling. See Cadence
and Cadenza.

REPOSE, in Poetry, &c. See Rest, Pause, &c.

Repore, in Painting, is applied to certain mazes, or large
systems of assemblages of light and shade; which, being
well conducted, prevent the confusion of objects and
figures; by engaging and taking up the eye as it cannot
attend to the other parts of the painting for some time;
and thus leading it to consider the several groups gra-
dually, and, as it were, to proceed from figure to figure.

Repore, in Military Language, is a phrase that applies
to troops which are allowed to be stationary for any given
period, during an active campaign, either through sickness,
or from some other cause.

REPOSITION of the Forest (formed from re, and ponere
to lay again), an act by which certain grounds, before made
purified, are, upon a second view, laid to the forest again.

Reposition, in Surgery, the reduction of a bone.

REPOSITORY, Repositorium, a store-house or place
where things are laid up and kept. In which fence we lay,
the repository of the royal society, the royal repository at
Woolwich, containing models of every sort of warlike
stores, &c. See Museum.

Repository of Farm Manure, in Rural Economy, the
place where it is put or laid up. See Receptacle of
Stall Manure.

Reposo, in Geography, a small island near the coast of
Brazi; s. lat. 19° 30'.

REPPELE, a town of Hinder Pomerania; 7 miles
W.S.W. of Zschau.

REPPIN, a town of Brandenburg, in the New Mark,
on the Eylant; six miles S.S.W. of Drono, N. lat.
52° 25'. E. long. 15° 2'.

REPREHENSION, in Rhetoric. See Paraphrase.

Representation, Representativo, in the
Drama, the exhibition of a theatrical piece; including the
scenes, machines, recitation, &c.

Sir Richard Steele's principle is, that the design of a play
is not to be read but represented; so that it is on the
stage, not in the pros, it is to be judged of; and that the
pits, not the public, are the proper judges.

Representation, in Law. See Descent, Right of
Crown, Interstate, Administration, and Parlia-

ment.

Representation, in Insurance, understood to mean
a collateral statement, either by parol or in writing, of such
facts or circumstances relating to the proposed adventure,
and not invested in the policy, as are necessary for the in-
formation of the insurer, to enable him to form a just esti-
mate of the risk. Such representations are often the prin-
cipal inducement to the contract, and afford the best ground
upon which the premium can be calculated. A representa-
tion may be untrue, either wilfully and fraudulently; or
inadvertently and innocently.

A wilful misrepresentation, or allegatio falsi, in any fact or
circumstance material to the risk, is a fraud that will always
avoid the contract. As if an agent, knowing that a ship
had failed from Jamaica for London on the 24th of Novem-
ber, effect an insurance on the voyage, and tell the under-
writer that the ship failed in December: this is a fraud,
and the policy is void.

And such misrepresentation so completely vitiates the
policy, that the insured cannot recover upon it, even for a

loss arising from a cause unconnected with the fact or cir-
cumstance misrepresented. As if the insured represent that
the ship or goods insured are neutral property, when in fact
they are enemy's property; he shall not recover even for a
loss occasioned by shipwreck.

So it would be if the broker or agent were to assert that
a ship or goods were neutral property, without knowing
whether this was true or false, and they are, in fact, enemy's
property; for, though it may not, perhaps, be equally
criminal in foro conscienti for a man to aver that to be true
which he knows nothing of, as to aver that to be true which
he knows to be false; but it is unquestionably a fraud, and
in the case of an insurance, equally injurious to the under-
writer; because he is induced by the deception, however
occasioned, to compute the risk upon false principles. The
faith reasoning holds even in the case where the perfons him-
self makes the representation believe it to be true.

But if he were only to say that he believes the ship to be
neutral property, knowing nothing on the subject, and
having no reason to believe the contrary: there, though
the ship be not neutral, the representation will not avoid
the policy; because the under-writer may inform himself of
the grounds of this belief, before he enters into the contract;
and if he neglect to do so, he takes upon himself the risk
of its being unfounded.

For the same reason, if the word expected be used, this
will not amount to a representation: as when a broker in
getting insurances effected on several ships, belonging to the
same owner, and speaking of them all, said,—"Which
vessels are expected to leave the coast of Africa in November
or December?" when, in fact, they had all failed in the May
preceding: this does not amount to a representation, being
only an expectation, the ground of which the under-writer
might have enquired into.

There is a material difference between a representation
and a warranty. A warranty, being a condition upon
which the contract is to take effect, is always a part of the
written policy, and must appear on the face of it: whereas
a representation is only matter of collateral information or
intelligence on the subject of the voyage insured, and makes
no part of the policy. A warranty, being in nature of a
condition precedent, must be strictly and literally complied
with; but it is sufficient if a representation be true in sub-
stance. By a warranty, whether material to the risk or not,
the insured makes his claim of indemnity upon the precise
truth of it, if it be affirmative, or upon the exact per-
formance of it, if executory; but it is sufficient if a repre-
sentation be made without fraud, and be not false in any
material point; or if it be substantively, though not liter-
ally, fulfilled. A false warranty avoids the policy, as being a
breach of a condition upon which the contract is to take
effect, and the insurer is not liable for any loss though it
do not happen in consequence of the breach of the war-
ranty. A false representation is no breach of the con-
tract, but if material, avoids the policy on the ground of
fraud, or at least because the insurer has been misled by
it.

It has already been shown that a warranty must appear
upon the face of the policy, and make a part of the writ-
ten contract; and therefore a written paper, wrapped up
in the policy, or even wafered to it, is only a represen-
tation. For the same reason, the written instructions for
executing the policy, unless inserted in it, cannot be deemed
a warranty, but only a representation; for the under-writer,
by not inflicting on having these instructions inserted in
the policy, shews that he is content to take them as a re-
presentation.
But it behoves all agents and brokers concerned in the effecting of policies, to keep correct entries of these instructions, and indeed of all representations made to the under-writers: for the whole question between the insurer and the under-writers often turns upon these instructions. Besides, they are answerable to the insurer for the consequences of any representation made by them without authority, as well as for those of omitting to make such representations as they have been instructed to make.

By an extension of equitable relief in cases of fraud, it seems to be now settled, that if a false representation be made to the first under-writer on the policy, in a material point, this shall be considered as a misrepresentation made to every under-writer, so as to infect the whole policy, otherwise it might be a contrivance to deceive many; for when a respectable under-writer finds first on the policy, the rest subscribe the policy without asking a question; and if the first under-writer be imposed upon, the rest are entrapped by the same fraud.

But the insurer must avail himself of this fort of objection in the first instance; for after a verdict has been obtained, the court will not set it aside upon an affidavit of the first under-writer, that a material misrepresentation had been made to him. The defendant, in such case, knows what has been represented to himself, and might have known what had been represented to the first under-writer; and he shall not lie by till after a trial, in order to make the objection, if the verdict should be against him.

If the insured state his computation as false, instead of the information on which he founds his computation, and it prove untrue, it is a misrepresentation; and if material, it will avoid the policy.

A misrepresentation in a material point equally vitiates the contract, whether it be the misrepresentation of the insured himself or of his agent, and whether it proceed from fraud, mistake or negligence; for the insurer is thereby led into an error, and computes the risk upon false grounds.

As a representation is only matter of collateral information, it is sufficient if it be true in falseness; and its not being inferred in the policy in the form of a warranty, is looked upon as a proof that the insurer does not require it to be strictly and literally true. Although the voyage be represented as being less than the voyage described in the policy, yet, if there be no fraud, and the voyage actually performed be within the policy, it will be protected by the policy. Even if a representation as to the course of the voyage be literally untrue, yet if it be made in conformity to an established usage of trade, and no person be deceived by it, and the voyage meant to be performed be within the policy, it will not avoid the contract.

Every representation respecting the date of the ship, and the time of her falling, is material; and therefore if it be stated that a ship was ready to sail on a certain day, when, in fact, she had sailed the day before, this is both a misrepresentation and a concealment, and will avoid the policy.

Concealment, or "suppression veri," is nearly allied to misrepresentation, or "allegatio falsi," and consists in the fraudulent suppression of any fact or circumstance material to the risk; and this, like every other fraud, avoids the contract ab initio, upon principles of natural justice. But it is not merely on the ground of fraud that a concealment avoids the contract; for even a concealment which is only the effect of accident, negligence, inadvertence, or mistake, will be equally fatal to the contract, as if it were intentional and fraudulent. Whatever respects the date of the ship, the time of her falling, the nature of the employ in which she is to be engaged, &c. ought to be fully disclosed; and the keeping back of any part of this fact will be fatal to the contract. In such case, the concealment so vitiates the policy that it will afford the insurer no remedy, even for a loss arising from a cause unconnected with the fact or circumstance concealed; for a concealment is to be considered, not with reference to the event but to its effect, at the time of making the contract. A well-founded fulpicion of concealment will amount in the courts to proof of fraud. As it is in some cases necessary to flate to the under-writers the nature of the service in which the ship is to be employed; if this be attended with any extraordinary danger, the concealment of it will avoid the policy. A material concealment is fatal, though the fact concealed was not disclosed, because the broker thought it immaterial. Doubtful rumours respecting the safety of a ship which it is intended to insure "lost or not lost," ought to be faithfully disclosed to every under-writer; and the withholding of such information will avoid the contract. The obligation of a strict observance of good faith is equally binding on both parties in all contracts; and in that of insurance, the under-writer, as well as the insured, is bound to disclose all circumstances within his knowledge affecting the risk. If, therefore, it should appear, that at the time when he underwrote the policy, he knew that the ship was arrived safe, the contract will be void as to him, and an action will lie against him to recover back the premium.

There are, however, many matters, which are open to both parties, and upon which they may both exercise their judgments, with regard to which they may be innocently silent. The insured need not disclose what the under-writer knows, or what he ought to know. The under-writer need not be told what lefens the risk agreed upon, and is under-flood to be comprised within the terms of the policy. He is bound to know every cause which may occasion natural perils, as the difficulty of the voyage, the variation of fations, the probability of lightning, hurricanes, &c. He is also bound to know every cause which may occasion political perils, from the rupture of states, from war, and its various operations; and he is bound to know the probability of safety from the continuance and return of peace, from the incompleteness of the enemy, the weakness of their councils, or their want of strength. There are other circumstances with which the under-writer ought to know; and, particularly, it is not necessary to communicate to him, that the ship is foreign built, though this enabled her to fail without convoy, and without a licence to do so, being within the exception in the lat. 38 Geo. III. c. 76. § 6; it being the business of the under-writer to obtain this information for himself. In cases of concealment, the question must always be, whether there was, under all the circumstances, at the time when the policy was underwritten, a full and fair statement, or a concealment: fraudulent, if designed; or, though not designed, varying materially the object of the policy, and changing the risk underflood to be run; and in both cases avoiding the contract. It is not necessary that there should be any previous representation as to the fate of the ship, that being covered by the implied warranty that she is sea-worthy. For a variety of other particular facts and documents, relating to the subjects of representation and concealment, we refer to Marshall's Treatise on the Law of Insurance, vol. i. b. 1. ch. 9 and 10. See Warranty.

REPRESENTATIVE, one that perfonates, or supplies the place of another; and is invested with his right and authority.

The word representative is equivalent to procurator or proxy.
REPRESENTATIVE Character, in Political Economy, thus denominated by way of excellence, or in contradistinction to other kinds of representation, constitutes the ambassador, or minister of the first rank, who represents his master in his very person and dignity. It places him above all other ministers, who are not invested with the same character, and precludes their entering into competition with the ambassador. (See Ambassador.) Envoys are ministers of the second rank, and are not invested with the representative character, properly so called, or in the first degree. See Envoy.

REPRESENTATIVE Powers, in Metaphysics, a term introduced by Leibnitz, to signify that power of the human soul, by which it represents to itself in the universe, according to the situation of the body in the universe.

Wolffius calls this power vis representativa, to denote its being an active power, or rather a force actually exerting itself. For he expressly says, quod vis constituit in continuo agendi conatus. And he thinks that from this principle of a vis representativa, every phenomenon of the human mind may be accounted for. See his Psycholog. Ration. art. 529.

But it may be premised, that many will find this principle too obscure to be admitted.

When it is said, that our ideas are representative of things without us, or of the universe; it may be asked in what sense this is to be understood? Do they represent it, 1. As a picture does its original? Or, 2. As an effect of a cause? Or, 3. As a sign represents the thing signified? The first opinion is exploded in part by Locke and the Cartesians, and totally by Dr. Berkeley, late bishop of Cloyne. The second is admitted by Hobbes, but denied by Leibnitz himself and the idealists. The third should seem to be the opinion of Leibnitz, but he is not sufficiently explicit.

Dr. Berkeley admits ideas to be signs; but according to him they are arbitrary signs, depending on the immediate will of the Deity; hence the verbal language; and ideas only signify or suggest each other, and spirits; but not bodies, the existence of which is totally unknown.

REPRIEVE, or REPRISE, from reprendre, to take back, in Law, a suspending or deferring the execution of the law upon the prisoner for the present time.

A reprieve is properly a warrant from the king, for suspending the execution of a person condemned.

This may be, first, ex arbitrio judicis, either before or after judgment; as, where the judge is not satisfied with the verdict, or the evidence is insufficient, or the indictment insufficient, or he is doubtful, whether the offence be within clergy; or sometimes, if it be a small felony, or any favourable circumstances appear in the criminal's character, in order to give room to apply to the crown for either an absolute or conditional pardon. These arbitrary reprieves may be granted or taken off by the justices of gaol-delivery, although their fœlion be fini, and their commiision expired; but this rather by common usage than by strict right. (2 Hal. P. C. 412.) Reprievs may also be ex necessitate legis, as where a woman is capitally convicted, and pleads her pregnancy; which is referred to a jury of matrons. Another cause of regular reprieve is, if the offender become non compos between the judgment and the award of execution. See lunatic.

REPRIMAND, a sharp authoritative reproof. Such a person was reprimanded in court by the bench, &c.

REPRIMAND, a military punishment at the head of a regiment, is sometimes ordered by a court-martial, and sometimes only in the presence of the officers of the corps: it is generally given by one of the field-officers, and usually in such terms as these: "Captain, or lieutenant A. B., you have been tried for ——, and are, by the sentence of a general court-martial, found guilty thereof, and sentenced to be reprimanded at the head of the regiment; the disagreeable talk of doing it is affixed to me: I therefore do hereby reprimand you, and hope, that it may prevent your falling again into the like error." Non-commission officers are sometimes, though not frequently, ordered to be reprimanded.

REPRISALS, or REPRIEVALS, Reprißailles, in the Civil Law, a right which princes have to retake from their enemies such things as they unjustly detain from them; or other things equivalent to them.

The word is formed from the Italian reprisaglià, which signifies the same thing.

When a place is taken or held from a prince, he feizes another way of reprièval. Sometimes he takes men of the opposite party, by right of reprisals.

The Romans called this clariçato; and the Greeks had something like it under the name of androptêpa.

Reprisals are used between nation and nation, to do justice to themselves, when they cannot otherwise obtain it. If a nation has taken possession of what belongs to another; if it refuses to pay a debt, to repair an injury, or to make a just satisfaction; the other may seize what belongs to it, and apply it to its own advantage, till it has obtained what is due by interest and damage, or keep it as a pledge till full satisfaction has been made. The law of nations permits reprisals only upon a cause that is evidently just, as for a debt that is extremely clear. For he who forms a doubtful pretension, can at first demand only an equitable examination of his right. In the second place, he should, before he proceeds so far, have in vain demanded justice, or, at least, have the utmost reason to believe that it would be in vain for him to demand it. Then alone he may right himself. It would be too contrary to the peace, to the repose, and safety of nations, to their mutual commerce, and to the duties which bind them to each other, for any prince suddenly to apply to force, without knowing whether the other is disposed to do him justice, or to refuse it. It must be observed, in order perfectly to understand this article, that if, in a litigious affair, our adversary refuses the means of bringing the right to proof, or artfully eludes it; if he does not, with good faith, apply to pacific measures for terminating the difference; and, above all, if he is the first who begins acts of hostility, he renders the cause jult, which was before doubtful: we may then make use of reprisals, or seize his effects, to oblige him to embrace the methods of reconciliation, which the law of nature prefers. This is the last attempt before coming to an open war. As the wealth of the citizens forms a part of the total wealth of a nation, and between state and state, whatever is the property of the members is considered as belonging to the body, and is answerable for the debts of the body; it follows, that in reprisals they seize the goods of the subject, in the same manner as those of the state, or soveraign. Every thing that belongs to the nation is subject to reprisals, as soon as it can be seized, provided it be not a deposit trusted to the public faith. This deposit is found in our hands, only
only in consequence of that confidence which the proprietor has put in our good faith; and it ought to be respected, even in cases of open war. Thus it has been usual to behave in France, England, and elsewhere, with respect to the money which foreigners have placed in the public funds. He, however, who makes use of reprisals against a nation, on the goods of its members indiscriminately, cannot be taxed with feizing the wealth of an innocent person for the debt of another; for, in this case, the sovereign is to compensate those of his subjects on whom the reprisals fall: this is a debt of the state or nation, of which each citizen ought only to support his quota. It belongs only to sovereigns to use and order reprisals, in the manner here stated. This is a measure of too great consequence to be abandoned to private persons. In all civilized states, a subject who thinks himself injured by a foreign nation has recourse to his sovereign, in order to obtain the permission of making reprisals. This is what is called defining "letters of marque." See the next article.

We may use reprisals against a nation, not only for the actions of the sovereign, but also for those of his subjects. Accordingly the sovereign demands justice, or makes reprisals, not only for his own affairs, but also for those of his subjects, whom he ought to protect, and whose cause is that of the nation. But to grant reprisals against a nation, in favour of foreigners, is to set himself up as a judge between that nation and these foreigners, which no sovereign has a right to do.

As we may seize the things which belong to a nation, to oblige it to do justice, we may, for the same reason, arrest some of the citizens, and not release them till we have received entire satisfaction; the subjects thus detained being only regarded as a security to oblige a nation to do justice, if their sovereign is obstinate in refusing it. We cannot take away their lives, nor inflict any corporal pain upon them, for a refusal of which they are not guilty. But the sovereign may make use of force against those who refuse the execution of this right, and use as much as is necessary to surmount their unjust resistance. In this case, the true and just welfare of the state is the grand rule: moderation is always laudable in itself; but the conductors of nations ought to exercise it only so far as it is consistent with the happiness and safety of their people. A sovereign, however, has no right to oppose force, or to make war against him, who, in such a case, by ordering the making of reprisals, only exercises his just right. Whenever a sovereign can, by the way of reprisals, procure a just recompense, or a proper satisfaction, he ought to make use of this method, which is least violent and least fatal than war. Those who run to arms, says the excellent Vattel, without necessity, are the scourges of the human race, barbarians, enemies to society, rebels to the law of nature, or rather to the common father of mankind. There are cases, however, in which reprisals would be justly condemned, even when a declaration of war would not be so; and there are precisely those in which nations may with justice take up arms. When it relates to differences, not on an act of violence, or of an injury received, but of a contended right; after having in vain attempted ways of reconciliation, or pacific measures of obtaining justice, it is a declaration of war which ought to follow, and not pretended reprisals, which, in such a case, would only be real acts of hostility, without a declaration of war, and would be contrary to the public faith as well as to the mutual duties of nations.

There is one kind of retribution sometimes practised in war, under the name of reprisals, which we must here mention. If a general of the enemy has, without any just reason, caused some prisoners to be hanged, a like number of his men, and of the same rank, will be hung up; signifying to him, that this retaliation will be continued for obliging him to observe the laws of war. It is a sad extremity thus to put a prisoner to death for his general’s fault; and if this prisoner was before prominent in his life, reprisals cannot be made on him with any colour of justice. Yet as a prince, or in general, has a right of sacrificing the life of his enemies to his safety, and that of his men, if he is engaged with an inhuman enemy, who frequently commits such enormities, he appears to have a right of refusing life to fame of the prisoners he may take, and of treating them as his treated. But Scipio’s generosity is rather to be imitated. That great man, having reduced some Spanish princes, who had revolted against the Romans, declared to them, that on a breach of their faith, he would not call the innocent hostages to an account, but themselves; and that he would not revenge it on a disarmed enemy, but on those who should be found in arms. (Liv. I. 28.) Alexander the Great, having cause of complaint against Darius for some malpractices, sent him word, that if he continued to make war in such a manner, he would purify him to the utmost, and give no quarter. (Quint. Curt. I. iv. c. i, and ii.) It is thus an enemy, violating the laws of war, is to be punished, and not by causing the penalty due to his crimes to fall on innocent victims. Vattel’s Law of Nations, b. ii. ch. 18. b. iii. ch. 8.

Reprisals is also used for a letter or permission, which a prince sometimes gives a subject, upon a full cognizance of the cause; authorizing him to retake from the first persons he meets of the opposite party, as many effects as make an equivalent to what have been violently forced from him, and for which the opposite prince has refused to do him justice.

These permissions are also called letters of marque, or marit; and in the flat. 27 Edw. III. law of marque; in regard a person denied justice in another man’s territory, redresses himself by goods belonging to men of that territory. See Letters of Marque.

Reprisals is also used in the same sense with recapitulation.

Reprise, or Reprize, in the Commerce by Sea, a merchant-ship, which, having been taken by a corfairs, privateer, or other enemy, is retaken or recovered by a vessel of the contrary party.

The word is French, and signifies a redemption or retaking.

When a vessel, thus retaken, has been twenty four hours in the hands of the enemy, it is deemed a lawful prize. If the reprize has been made within twenty-four hours, the vessel is to be restored to the proprietor, with every thing in it, upon his allowing one-third to the vessel who made the reprize.

If the reprize has been abandoned by the enemy, either in a tempel, or from any other cause, before it has been led into any part, it is to be restored to the proprietor. See Recapture.

Reprise, in the Man of War, is a letter repeated, or a man of war recommenced. Thus we say, to give breath to a horse newly taken, the owner volt with only one reprise, that is, all with one breath.

Reprise, Fr., in Musc. Every part of an air or strain that is to be repeated, without being written out, printed twice over, is called the French a reprise. There are various ways of marking repetitions in music: first by a double bar dotted; if on both sides, both parts or strains are
are to be repeated; if only one side of the double bar is dotted, that side only is to be repeated. This sign \( \bar{\text{S}} \), and sometimes \( \text{du capo al fine} \) \( \text{S} \), imply a repetition of particular portions of a melody; as do, likewise, dots in the spaces of the staff. (See RENVOI and REFERENCE.)

Gretry, in his Memoires, says that the repeating of the first and second parts or strains of a movement is a barbarous custom.

Reprises, in Law, are deductions, drawbacks, or duties, paid yearly out of a manor, or lands. Such are rent-charges, fees of rewards or balllifs, &c. The manor of Doll yields \( \text{gol. per annum, ultra reprise,} \) besides all reprises.

Reprobation, Reprobatio, in Theology, a decree or resolve, which God has taken from all eternity to punish sinners, who shall die in impenitence.

Reprobation stands in direct opposition to election.

Divines hold it a symptom of reprobation, when a sinner is hardened so as not to feel any farther remorse or miktivings of conscience.

The caufal dittinguish two kinds of reprobation, positive and negative. Positive is that by which God is pleased to create men with a positive and absolute resolution to damn them eternally. This opinion of reprobation is counseleed by St. Augutline, and others of the fathers; and is strongly maintained by Calvin, and most of his followers.

Something like it is also found in the thirty-nine articles of the church of England; but it is now generally explained, as injurious to the justice of God. Negative or conditional reprobation is that by which God, though he creates all men with a sincere desire to save them, and furnishes them with the necessary means thereto, so that all may be saved, if they will; yet fees there are several who will not do it, with the aids he shall afford them, how powerful ever; and fees, at the same time, they would do it with certain other aids, which he fees, but will not give them. O altitudinal! &c.

By comparing one part of scripture with the other, says Dr. Doddridge in his "Lectures," (Prop. 142, schol. 3.) there seems to be this remarkable difference between the predetermination to life and that to death (here called reprobation), that, in the former case, God determines by the influence of his grace to work such a change in the hearts of his elect, as that their salvation should on the whole be ascribed to him, and not unto themselves; whereas he determines to bring others into such circumstances, that though their ruin should in fact happen, yet they themselves should be the authors of it, and the blame lie as entirely upon themselves, as if it had not been so much as foreseen. (See Rom. ix. 22, 23. Matth. xxv. 34, 41.) But the opponents of this doctrine allege, that this kind of reasoning is an evasion and not a solution of the difficulty. This learned divine, adverting to the objection, that the above-quoted doctrine tends to make the pertons whom it concerns despair, oberves, that if it be granted, that sufficient afflictions are given to all, none will have reason to despair, nor will any have an excuse to plead before God, in conqquence of his secret purposes, which will not be made a rule of his final judgment. If it be said, that nevertheless those who are not predeterenned to life are left under a necessity of perishing, and an impossibility of salvation; it must be owned, that it is difficult to say, how the doctrine, as explained by some, can be freed from this objection; but that this conqquence does not necessarily follow from it, according to his state-

ment. See Election and Predetermination. See also Sublapsarian and Supralapsarian.

REPRODUCTION, in Phvsiology. In speaking of the growth of organic bodies, we must notice their power of reproduction; that wonderful property of restoring or renewing parts that have been mutilated or entirely lost. This is one of the most important provisions of nature, inasmuch as it guards animals and plants against the multiplied dangers to which their bodies are exposed. Hence, when viewed in connection with the system of nutrition altogether, it forms one of those decisive and grand characters, which distinguish at once the machines that proceed from the hand of the Creator, from all, even the most ingenious and boasted, productions of human skill. The difference is recognized at the first glance; the distance is immeasurable. The springs and wheels of mechanical instriments have no power of repairing themselves, when they are bent, broken, worn, or spoiled; but such a faculty is enjoyed in various degrees by every animal and by every plant.

At different periods of the year, several organised beings lose, by a spontaneous and natural process, certain parts of their body, which are subsequeulty renewed. Examples of this occur in the fall of the flag's horns; in the molting of birds; in the renewal of the cuticle of serpents, and other amphibia, of the larvae of insects, and of the shell of the crustaces; the fall of the leaves of trees, &c. This may be called ordinary, or natural reproduction. The flag's horn, or antler, as it should be more properly called, is a mass of true bone, possecling the structure and characters of osseous substances. In its early state it is soft, and traversed by large vessels, which must be reproduced every time the new horn is formed. This annual reproduction constitutes, in many points of view, one of the most remarkable phenomena of animal physiologv. It affords a most striking proof, of the power of the nutritive process, and of the rapid growth, which is dependant on this in warm-blooded animals. For the horn of a flag, which may weigh a quarter of a hundred, is completely formed in ten weeks. 2dly. Of a limited duration of life in a part of an animal, entirely independent on the life of the whole animal, which in the flag extends to about thirty years. 3dly. Of change of calibre in particular vessels. For the branches of the external carotid, which supply the horn, are surprinsingly diluted during its growth; and recover their former area, when that process has ceased. 4thly. Of a peculiar sympathy, which is manifested between the growth of the horns, and the generative functions. For castration, or any effential injury of the organs of generation, impedes the growth, alters the form, or interrupts the renewal of the horns. See the articles Cervus, and Horn, in Comparative Anatomy.

The cuticle of the snake is separated every year, and comes off as a complete sheath, excepting the aperture, through which the animal escapes: the covering of the cornea is shed with the rest of the external integument.

Crustaceous animals (the crab, lobster, &c.) have a skeleton, which furrounds and contains their soft parts, and which serves, at the same time, the purposes of a skin. When it has attained its perfect conqquence, it grows no more; but, as the soft parts still increase, the shell separates, and is detached, being succeeded by a larger one. The calcareous bodies in the stomachs of these animals, performing the office of teeth, are shed with the shell. See the article Cancer, in the account of the species ruricola, and gammarus.

The larvae of insects cast their cuticular covering several times before their transformation. An interesting account of the
the particulars may be seen in the article Entomology, in the division "of the larva state," under the subdivision "lepidoptera."

The second, or extraordinary kind of reproductive power, is that by which wounds, fractures, or any accidental mutilation or lobs of parts of an organized body, are remedied or restored. This exits in very different degrees in different departments of the animal kingdom. In man, and such animals as are nearly allied to him, the property is very limited, although sufficiently active to be capable of remedying the effects of great injuries. If a bone be broken, a muscle or tendon divided, or a piece of skin destroyed, processes are set up in the parts by which restoration is accomplished. The ends of the bone are joined by an osseous substance, which gives to the part its original solidity; the tendon regains its firmness and power of restitution; the muscle can contract again and move the points of its attachment; and the surface of the body is covered by a new piece of integument. The functions of the parts are restored; but the newly formed matter can be always distinguished from the original composition of the body, and possesses a weaker vitality. For, in some cases, old ulcers have broken out afresh, and even fractures have been divided in states of great general debility. A divided nerve is reunited, even if a small portion be removed: the function of the part, suspended for a time, is thus restored. The cafe is different in the blood-vessels: the processes consequent on wounds of these tend to stop the hemorrhage, which in general can be effected only by the obliteration of the tube.

The power of repairing the effects of injury is modified by various circumstances. The health and strength of the individual, the age, the air, and other circumstances, which the surgeon must attend to, have great influence.

In the cases which have been just mentioned, the restorative power repairs injuries; but it goes no further. Neither in man, nor in any warm-blooded animals, are entire organs ever reproduced. If a limb be cut off, or a piece of flesh taken away, the wound is healed, the chasm is filled up; but the lost parts are never formed again.

In the lower orders of the animal kingdom, on the contrary, such are the strength and perfection of the reproductive energy, that considerable members are formed again, and we can hardly assign a limit to the power in some instances. The lower we descend in the scale of beings, the more surprising are the manifestations of this reproductive faculty. It is familiarly known, that the claws of the crab and lobster, and the entire limbs or tail of the newt, can be restored: the fame holds good of the rays of the star-fish (asterias), and the arms or tentacles of the cuttlefish. It was asserted by Bonnet and Spallanzani, that the entire head of the snail can be reproduced; but the attention was suspected, because other experimentalists did not succeed in repeating the trials. Hence Blumenbach was led to observe, "that some experiments on this reproductive power require a hand exercised in such employments, together with various precautions, and a favourable combination of circumstances, for their success. Hence persons must be cautious in concluding against the truth of any statement, because their own experiments do not succeed. After several fruitless attempts on this subject, I have lately succeeded in observing the reproduction of the whole head of the snail (helix pomatia) with its four horns, which occupied about six months." Comparative Anatomy, translated by Lawrence, p. 219.

The same physiologist has given us a remarkable instance of reproduction in an animal of more complicated structure.

"I preserve," says he, "in spirits a large water newt (lacerta palustris), from which I extirpated nearly the whole eye several years ago: all the humours were discharged, and then four-fifths of the emptied coats were cut away. In the course of ten months an entirely new eye-ball was formed, with cornea, iris, crystalline lens, &c.; and this is only distinguished from the same organ on the opposite side by being smaller." Ibid.

Not only are amputated tentacula speedily replaced in the actinize (tea anemones), but, if the animal be divided by a vertical or horizontal section into two halves, each of these becomes an entire actinia. See the article ANEMONE.

The fresh water polype exhibits very surprising powers in this way. If it be cut into two or more pieces, these become perfect animals. If it be slit half way down, the two halves are rendered perfect, remaining united below: these may be slit again with the same results. The opposite ends of two polypes may be made to grow together, &c. See POLYPS.

See the memoirs on animal re-productions in Spallanzani's tract: also the works of Bonnet.

REPROOF, OR JERGATIO, in Rheteric, is distinguished from inspective; which fee.

REPS, in Geography, a town of Transilvania: 16 miles N. of Fagaras.

REP-SILVER, money anciently paid by servile tenants to their lord, to be quit of the duty of reaping his corn.

REPTILES, in Comparative Anatomy and Physiology. Although the animals, whose structure we are about to explain, are perfectly similar to each other in their principal characters, and ought therefore to be united in one class, naturalists have experienced a real difficulty in discovering an appropriate name for the class. That of amphibia, employed by Linnaeus and his disciples, although deduced from a lurking circumstance in the economy of the more generally known reptiles, namely, the power of existing for a long time in water, as well as in air, is vague and uncertain in its signification. If we regard as amphibia those aquatic animals, which are able to live for some time on land, or those land animals, which can remain for a certain time under water, all animals are amphibia; for even the human subject and the mammalia can dive. If, on the other hand, the word amphibious be taken etymologically, and understood to denote an equal power of subsisting in air and water, it is applicable to no animals. Although reptiles can remain much longer under water than the mammalia, or birds, they are obliged, as their respiratory organs are only calculated for breathing air, to come sooner or later to the surface for this purpose; and they are drowned, like any warm-blooded animal, if detained in the water beyond that time. To enable an animal to exist equally in air and water, it should have lungs and gills; that is, it should have the power of breathing air, like the mammalia and birds, and of breathing water, like fishes; and it should be able to use either of these methods, to the exclusion of the other. But we know of no such animals. The larvae of frogs and falamanders, the poecies anguinus, and the firm lacerta (see the latter part of this article), have indeed branchiae and lungs; but as far as our knowledge hitherto goes, none of these could live out of the water. The lungs of the tadpole, and of the larvae of falamanders, are designed for the service of those animals in their subfrequent stage of existence; but do not give the power of breathing in air; and the lungs, either of the poecies or firm, do not seem sufficient to enable them to differe with the office of the branchial appendages. In its etymological sense, then, the term amphibious is not applicable to any animals we know of.

Linnaeus
Linnaeus places among the amphibians the reptiles that never go into the water, and some fishes which never quit it. He could not fail to experience great difficulties in naming a class so ill conceived as that of his amphibians; consequently, this appellation is objectionable, as being vague and obscure; the genera comprehended in the Linnaean class amphibians, are too ill assorted to admit of their having a common name suitable to all. Daubenton divided them into two classes, naming one oviparous quadrupeds, and the other serpents. Lacépède adopted these two classes, and placed between them a third, that of oviparous bipeds. Hermann of Straßburg, in his "Tabulae affinitatum Animalium," proposed to subdivide it, for the term amphibia, that of crayeroza. "Si in novorum nominum impositione gloriarse more multorum quereremus et ea re scientia promoveret, crayeroza apte vocari posse puteremus, quia omnem fere naturam eorum animalium vox ita exhaurire videatur." Kupros enim non modo frigidum, fed et horridum luidumque significat." Hermann, Tab. affini. Anim, p. 218.

Without entering further into the objections against the appellations just enumerated, we adopt that of reptiles, already employed by many modern naturalists, and particularly by Cuvier, in his "Tableau Élémentaire d'Histoire Naturelle." In fact, in the progression of the oviparous quadrupeds, as well as in that of serpents, the belly moves against the surface of bodies, over which they pass.

General Observations.—Referring to the article Classification for a view of the genera comprehended under these divisions, we prefix to the more detailed survey of the anatomy of reptiles, a short summary of the principal anatomical characters of the four orders into which the class is divided.

1. The Chelonian order; Turtles. Body inclosed in a bony shell. They resemble birds in having the masticating surfaces of their maxillary bones covered by strong cutting horny plates. Body supported on four limbs, terminated by a tail, and covered in almost all by scales. They copulate; fertilization takes place internally; the female lays eggs, covered by a firm calcareous shell: the young animals come out without incubation, merely by the heat of the atmosphere; and they undergo no metamorphosis. Stomach larger than in the other reptiles, and intestinal canal furnished with a cæcum. The heart has two auricles.

2. Saurian order, or Lizard kind. They resemble the former very nearly in the structure of their principal internal organs. They have firm bones, like those of the mammals: curved and long ribs, and a sternum. Teeth set in the jaw. The two branches of the lower jaw conflated. A trachea composed of cartilaginous rings, an os hyoideum and larynx, capable of producing sounds, at least in some individuals. Heart with two auricles. A simple penis in the male. There is a real internal copulation; the female lays separate eggs, generally covered with a firm shell, depositing them on dry ground, or in holes. The young ones come out of them, and undergo no metamorphosis. The skin is furnished with numerous plates or scales. Body elongated, and ending with a tail. Feet, often high, and strong enough to sustain the body above the ground in progression. Some are quadrupeds; others biped, having either fore or hind feet. Toes furnished with nails; generally five in number; but there may be four, three, two, and even one.

3. Ophidian order; Serpents. They agree with the two former orders, in having firm bones, curved and long ribs, a larynx and trachea, capable of producing a flight hissing in a moist. An external organ of generation in the male. A real internal copulation: the female lays eggs covered with a calcareous shell, which she deposits in holes filled with leaves, under the roots of trees, in warm and rather moist situations. The young ones, when they quit the egg, are like their parents. They differ from the preceding orders, in having a long, eel-shaped, flexible body, covered with a skin, either furnished with scales or plates, or naked, unprovided with feet, and terminated by a tail, often very long. Numerous long curved ribs, not united together, as there is no sternum. The branches of the lower jaw not united in front. Upper jaw consisting of four branches. Simple, sharp, and numerous teeth; and long, curved, tubulated fangs, in addition to these, in the venomous kinds. They creep along the ground by undulations of their body. Excepting the ophii, they have no external auditory openings. Heart with a single auricle. Double penis. Eggs covered with soft calcareous shelly.

4. Batracian order; Frog kind. They resemble the preceding orders in having a tail; excepting the frogs and toads in their perfect state: a trachea and larynx, capable of producing sound. Like the chelonian and saurian reptiles, they have feet, and simple jaws, i.e. not formed of two branches, moveable on each other. In common with the saurian and ophidian orders, they possess teeth fixed in the jaws; and with the ophidian, a heart with a single auricle.

Many characters distinguish them from these three orders. Their naked skin, which is warty or tubercular, more or less moiré, and nearly similar to that of the eel, the latus genus of the ophidian order. Softness of the bones; a sterne without ribs in the frogs and toads; rudiments of ribs and no proper sternum in the salamanders; true curved ribs and vertebrae forming the body: in the pregnant and fired. Four feet, or two only. They all swim; those with long hind legs and no tail leap; the tree-frogs attach themselves to leaves by the round tubercles of their toes: those with four equal limbs, or two only, crawl and swim, but do not leap. An external tympanum in the tree-frogs, frogs, and moist toads; no external ears in the others. No external organ of generation in the males, nor any internal real copulation. The female lays eggs in the water, or humid earth, and the male fertilizes them as they pass out; or in the ovo-viviparous species, as the land salamander, the femoral lichen of the male is absorbed by the sexual organ of the female. The ova are without shells; from them proceed small animals, called tadpoles, which undergo various changes before reaching their perfect state. They have their limbs in their tadpole condition, and thus approach to fishes.

Notwithstanding the obvious differences of organization in the different reptiles, as the turtle, lizard, serpent, frog, and salamander, we may remark that their structure does not deviate essentially in its general plan from that of the human subject. They have a bony vertebral column, and all the principal organs found in man, but with more or less striking modifications.

Reptiles have some relations, in their organization and habits, with other vertebral animals, particularly with fishes. This is seen in the true branch of the batracian larvæ and firen; in the scales of the skin in lizards and serpents; in the polygonal horny plates of the tettigines, corresposing to those of some cartilaginous fishes; in the elongated form and habits of the firen, like those of the eel-shaped fishes.

The form of the body presents great differences in the reptiles; nearly all the chelontians, saurians, and batrachians have four feet; and there are only two saurians with two feet. In the chelontians, the body is ovoidal, more or less convex, inclosed in a bony case, and terminated by a small tail; the toes are separate and distinct in some, palmated and fin-like in others. All the saurians have an elongated body, covered with various kinds of scales, and terminated
by a very flexible tail, often composed of articulated rings. In the very elongated form of their body, the chelics resemble serpents, though, in other respects, they are true faurians. The skin is quite naked in all the batracians; they have four feet; some have no tail, a flout, thick body, and the hind legs longer than the front; others have the shape of a lizard, being furnished with a tail, and having feet of equal length. Lastly, serpents have a very long, cylindrical body, covered with scales, and without limbs. These variations of figure must necessarily be attended with modifications in the form and position of organs; the internal arrangements will correspond with these outward forms.

Although the animals of this class differ very considerably in outward form, as well as in the general bulk of their bodies, they agree very nearly in the essential points of their organization, and more particularly in the functions of their animal economy. We may instance the mode of taking their food; the long abstinence of which they are capable; their oviparous generation; the length of time, for which they can bear an interruption of respiration; their tenacity of life and extraordinary power of reproduction; and the low temperature of their bodies. The last points, of animal heat and reproduction, two exceedingly interesting subjects of inquiry, which have been investigated of late years with great industry, form the most striking differences between cold and warm-blooded animals; the latter alone possessing that remarkable property of maintaining in themselves a temperature considerably exceeding that of the medium in which they live, while the former are distinguished by the wonderful extent of their power of extending or reproducing injured or lost parts.

An accurate knowledge of the structure of reptiles is not only important from its subserviency to the classificatory arrangements of natural history, and highly interesting from exposing to us new and rich scenes in the vast domains of nature, new forms of life, and fresh modifications of organization, accompanied with singular changes of functions already familiar to us in other classes; but it acquires additional interest from the great use which physiologists have made of different reptiles in their experimental elucidations of the human economy. We must survey in a general view the structure and economy of these animals, and compare them with those of the warm-blooded classes, before we can determine how far the conclusions, drawn from experiments on reptiles, concerning the heart's motion, irritability, the action of the nerves, the effects of opium, &c. &c. can be transferred to the human body.

Organ connected in the Vital Functions. — The mouth is situated at the extremity of the snout, and directed transversely. If we fancy the head to be divided by a horizontal cut, extending from before backwards, to its very posterior part, we shall have a just idea of the mouth of a reptile. The cranium is very small in this class, and the head constricts almost entirely of the two jaws. The lower is articulated towards the back of the head, and thus allows the opening between the two mandibles, constituting the mouth, to be very considerable. Almost all reptiles swallow entire animals, and thus require this extensive opening. The margins of the aperture constrict firmly of the maxillary arches, which are not covered or enclosed by any thing deserving the name of lips. In no case is there any mastication; and the food or prey is taken by the teeth or tongue, so that a movable covering of the jaws, similar to the lips and cheeks of the mammalia, is not necessary either for confining substances subjected to the action of teeth as organs of mastication, or for the purpose of reaching or seizing food.

The horny coverings of the mandible, completely naked, and not concealed even by the smallest fold of skin, form the sides of the entrance into the mouth of the chelonian reptiles. Their food consists of marine vegetable productions, teffaceae, and does not require to be large or opening for its introduction, as when considerable animals are swallowed whole. The mouth is consequently smaller in this than in either of the other orders; and does not extend completely to the back of the head.

The family of tortoises, which Geoffroy has called trionyx, offers a remarkable exception to what we have stated about the absence of lips; they have these folds, and a moveable proboscis at the end of the snout. "The existence of lips in these tortoises is an anomaly, the more likely to surprise us, inasmuch as the affinity of these reptiles to birds seems to assign a motive for the absence of lips, and also for the existence of the horny coverings of the mandibles." Geoffroy St. Hilaire, Mem. pour les Tortues molles; Annales du Museum, v. 14, pl. 1, p. 9.

In the faurians, the slit of the mouth goes to the very back of the head, far behind the ear. Its appearance is very formidable in the crocodile, where the hard strong jaws project into a large snout, and are armed with sharp powerful teeth, deftute even of gums; these jaws open to the very back of the head, and disclose a tremendous throat. The mouth is as large proportionally in the other faurians; but their size is too insignificant and their habits too harmless to allow of their inspiring that terror, which the formidable weapons of the crocodile so justly cause. The ophidian have not only a mouth equal in its transverse measurement to the diameter of their body; but they possess also the means of enlarging this aperture, so that they can swallow creatures whole diameter exceeds their own. The batracians have an opening as large as the size of the skull will allow. In the latter, as well as in the ophidian, and most of the faurian reptiles, the interguments make a small fold at the edge of each jaw; these folds meet when the mouth is closed, so as to hide the edge of the jaws, but they possess no power of motion.

In the tadpole, in the protos and sirens, the mouth is much smaller than in the other reptiles; and they possess folds more deserving the name of lips. In the former there is a kind of horny apparatus within these lips, forming something like a beak. In the smallness of its mouth, and in these horned jaws, the tadpole is remarkably similar to the perfect animal.

The Jaws. — In considering the jaws and their muscles, the teeth, and the tongue, we must bear in mind that these organs are calculated merely for seizing their food, and conveying it to the throat; in no case does the food undergo any mastication, as in the mammalia.

No reptiles have an upper jaw moveable on the head, like that of birds: the superior maxillary bones are in truth articulated moveably with the head in serpents, and may be extended and retracted, or moved laterally, as we shall describe presently; but, in general, the cranium and upper jaw are united into one piece, so far as their motions are concerned.

The most opposite opinions have prevailed respecting the crocodile, even down to the present time. Herodotus first observed, that it is the only animalpolelling an upper jaw moveable on the lower, which remains fixed. The same opinion was generally held by the ancients, as Aristotle, Pliny, &c.; and several moderns speak in the same way, as Marograph, Marmol, Jacobins, Vecellius, and the Jesuits Millionaries at Siam, who had opportunities of observing the living animal. But the anatomists of the Academy of Sciences
REPTILES.

Sciences (Desmarest and Ducerney) undertook to demonstrate the falsehood of the opinion of Herodotus. Geoffroy, one of the French savans, who attended the Egyptian army, has given us an account of the matter, which settles all these disputes, by proving that the statement of Herodotus is almost rigorously true; and that the crocodile is the only known animal, whose upper jaw, including within its branches the cranium, is movable on the lower jaw, which polishes only an almost insensible degree of motion. "Nothing can be more paradoxical than the head of the crocodile; every thing which is placed laterally in other animals, as the moving powers of the jaw, &c. is thrown behind. The temporal bone itself extends backwards far behind the cranium, is elongated, and transformed into a double condyle. We have in fact nearly described the crocodile's head, when we say that it consists of two mandibles; for the cranium is so small, and out of place, that it escapes notice at first. We find it below, and a little in front of the occipital crista. The brain is so far forwards, that the eye and ear are above and a little behind it.

The lower jaw is one-sixth longer than the upper, with the cranium: it presents a cavity with a double surface, in which the condyle of the temporal bone is articulated by ginglymus. The occipital condyle is in the same line as the temporal condyles: thus the head is really held at its articulations, like the lid of a box by the hinge, and is confined entirely to motions upwards and downwards. When a living or stuffed animal is examined, it is difficult to believe that the head ends at the extremities of the jaws. There is a regular fullness of the front of the neck, which might be regarded as the frontal part of the head; this arises from the enormous temporal muscles, which lie between the recti and obliqui. The latter, arising from the cervical vertebrae, and inserted in the occipital crista, elevate the head upon the neck, making it describe an arc of 45°. The skin behind the occiput being thin, yields to the motions of the head; while the lower jaw, on the contrary, is inclosed in a kind of flesh of hard, rugous skin. If there were a muscular force capable of drawing it down, this covering would impede its descent, while it is still further confined behind: the long processes situated beyond its articular surface, describing a curve, approaches the skull exactly at the point where it is armed with a long scale, which offers an almost invincible resistance to the elevation of the condyle, and consequently to the depression of the jaw. Yet it is not entirely fixed, as Marcol imagined, who stated that it forms a single bone with the sternum. Two small muscles have the power of moving it slightly." (Annales du Museum, tom. ii. p. 38, et seq.) This description is accompanied with an excellent figure of the skull, in the elevated state of the upper mandible. An analogous figure of the whole head is given by Humboldt, Recueil d'Obf. de Zool. & d'Anat. comparées, tom. i. pl. 4. From the figures of the Nilotic crocodile, in Blumenbach's Abbildungen Natur Historischer gegenständ, N° 26; and of the St. Domingo crocodile, in the Annales du Mus. tom. ii. it appears, that the animal most frequently exhibits this elevation of the upper jaw. It cannot be necessary to point out how the raising of the entire cranium and superior mandible, just described, differs from the motion of the upper jaw upon the cranium: this has been already done by Blumenbach. See Sytem of Comparative Anatomy, p. 111, note 8.

The length of the lower jaw is much more considerable in comparison to that of the upper in reptiles, where it is articulated far back, and is even prolonged beyond its articulation, than in mammals and fishes, where this articulation is placed more forwards. Its composition is more complicated in the reptiles, than in any other order. In the green turtle (Testudo mydas) it consists of seven distinct pieces, a middle one forming the arch, and three others on each side, forming a continuation of its branches. The farthest of the three penetrates like a wedge between the two others, and forms a great part of the articular cavity. In many of the fursians the number is still greater: the lower jaw of the Nilotic crocodile, and of the caiman (croc. americana), has no fewer than twelve pieces, arranged as follows. As the two branches are distinct, and united by a future, each of them must be composed of six pieces; 1, one, in which all the teeth are implanted; 2, another, lying along the internal surface of the former, without reaching to its anterior extremity; 3 and 4, two others articulated with the preceding; vis. an inferior one prolonged to the posterior extremity of each branch, a superior extending as far back as the other in the Nilotic crocodile, but not so far in the caiaman.

5. The greatest part of the articular cavity is excavated in a fifth piece within the two former, and constituting the inner and superior part of the portion beyond that cavity. 6. Lastly, a fifth piece forms the inner and outer part of the orifice of the dental canal. The lower jaw of the tupinambis (lacerta monitor) is also composed of twelve pieces, two of which form the coronoid prociples, while the other ten are analogous to those described as entering into the formation of the lower jaw of crocodiles, excepting the last. There are eight or ten in most of the other fursians. We find four in each branch in the genus anguis; an anterior one united to its corresponding piece in front, and three posterior ones joined to the former. There are only four altogether in the amphibia. The two last mentioned genera are the only ophidian reptiles, in which the jaws are not separated in front. In all the others there is a separation, and each branch has only two distinct pieces; an anterior, in which the teeth are implanted, and a posterior: they are united by future, and vary in relative length, according to the number of teeth. The very open arch, composing the lower jaw of the batrachian order, is made up of six pieces; the middle of which are the most slender.

The anterior angle, formed by the union of the two branches, depends on the form of the snout in general, on the figure of the two branches, the prehension of the teeth, &c. It is rounded and very open in the chelonian reptiles, and more so in the batrachian. In the ophidian order, which have the branches of the jaws movable, it is susceptible of change, according as their extremities are approximated or drawn asunder; indeed in the former case only can it be properly said to exist at all. It is rounded in the amphibia; more angular in the anguis; still very obtuse in the gekkos (lacerta gekko), which have wide jaws, with the branches of the lower curved only in the horizontal direction; it is less so in the camelone and felino (lacerta felino), the ferniks (lacerta feineus), and the lizards, although in all these the two branches are only joined by their extremities. It is acute in the tupinambis and iguana, in which the branches, somewhat curved in the vertical direction, are approximated for a longer space. The Nilotic and Garrettian crocodiles differ very much in this respect. The two branches are united in the latter in the greatest part of their extent, as in the cachalot, and consequently form a long bill, in the edges of which the two rows of teeth are implanted. In the former, on the contrary, the branches remain separate, and only approximate towards their extremity, increasing a little in thickness at the symphyses.

The portion of the bone, which is incurved towards the cranium in most of the mammalia, and constitutes
the ascending branch of the jaw, does not exist in reptiles.

*Motions of the Jaw.*—Reptiles may be divided into two orders, according to the conformation of their maxillary bones, and the kind of motion of which they are susceptible.

In the first would be placed those which have the lower jaw only moveable, as the lizards, the telfudines (tortoise and turtle), the frogs, the falamanders, and the general amniota and amphibians among the serpents. The second would include the colubres, and the venomous reptiles, which can move both jaws.

The general disposition of the articulation is nearly the same in reptiles as in birds (see Birds, in Comparative Anatomy). Instead of a condyle at the posterior extremity of the jaw, an articular surface is excavated to receive an eminence bearing considerable analogy to the os quadratum of birds, and differing from it only in not being moveable; often, indeed, it is only a simple prolongation of the temporal bone. To this most inferior point of the cranium, and to an articular surface nearly transverse in its direction, and shaped like a condyle, the lower jaw is articulated by a glenoïd cavity, of which the middle part sometimes preends a rising line, converting it into a kind of pulley. Behind this articular cavity there is often a more or less considerable bony process, affording attachment to a muscle analogous to the digastric.

The most remarkable differences requiring our notice here are, the form of this prominence or condyle of the temporal bone; the greater or less prolongation of the process behind the articulation; the situation and extent of the temporal fossa; and, lastly, the existence or absence of the eminence occupying the situation of the coronoid process.

In proportion as the temporal eminence is carried backwards, the jaws approach more nearly to each other in their longitudinal direction. We see this in the crocodile, falamander, frog, turtle, and tortoise. When, on the contrary, it descends vertically, or very obliquely, and is very elongated, as in the camelion and iguana, it forms a kind of pedicle to the lower jaw, which, by separating it from the cranium, produces a much more considerable interval between the jaws. Several kinds of lizards, as the lacerta agilis, draco, &c. occupy the intermediate space between these two extremes.

The crocodile has the largest process for the attachment of the digastrics. It is feebly diminished in the camelion, the gecko, the tupinambis, and the telfudines; and we see nothing of it in the pipa, the toad, frog, and falamander.

All four-footed reptiles have very deep temporal fossa; they are united to the cavity of the orbit. In some species, the two cavities are separated in front by a bony circle, as in the telfudines, the crocodile, the dragon, and the other lizards; but in the pipa, the frogs, and falamanders, there is no orbital circle.

There is, in the crocodile, a considerable excavaaion on each side of the cranium, behind the orbit, terminating below in the temporal fossa, and wanting in the crocodile with bony eyelid (Crocod. palpebrofas, Cuvier). It is bounded externally by a bone corresponding to the squamous portion of the temporal, which joins the lateral frontal bone, and thus forms a second kind of zygomatic arch. The size of this excavation differs much in the different species. No doubt it contains muscles. But we find no express and satisfactory description of it and its muscles, nor of the muscles of the jaw in the writings of the French naturalists already quoted, on the subject of the crocodiles.

The coronoid process of the lower jaw is not prominent in reptiles. There is a mere rudiment of it in the telfudines, the camelion, and some lizards, as the iguana, but there is no trace of it in the crocodile, the frogs, and falamanders.

The muscles of the jaw, in the oviporous quadrupeds, are analogous to those of the mammals, and resemble them in number.

The maffeter is large and distinct in the tupinambis, occupying all the space comprised between the posterior edge of the orbit and the internal auditory. It is directed obliquely from behind forwards, so that it raises and carries the jaw backwards. This muscle is small in the agame marbré (lacerta marmorata), and the turtle. It is so slender, that it can scarcely be distinguished from the lower part of the temporal.

The temporal muscle is very large in the turtle, occupying all the temporal fossa, and forming the back of the orbit. It is much smaller in the tupinambis and common lizard, in which it is almost entirely concealed by the maffeter.

The pterygoidei are, in general, but imperfectly distinguished from each other. They envelope the whole branch of the jaw towards its extremity in the tupinambis; their fibres are in a manner twisted. They elevate the jaw and carry it forwards; thus they act in an opposite direction to the two preceding muscles. The same muscles are flat and thin in the turtle; their fibres are nearly transverse, so that they can move the lower jaw more directly from side to side.

In all these reptiles the muscle analogous to the digastric is flat and triangular; the bread portion is fixed to the cervical ligament behind the occiput, and the point terminates at the extremity of the jaw, behind its articulation, and near the pterygoide muscles.

After describing the muscles employed in moving the jaws of the turtle, Perrault affirms, in his *Mémoires fur les Animaux,* that it has more power in its jaws than most other animals, that it can cut very hard and strong fibres, and that the head of a small turtle has been seen, half an hour after it was cut off, to strike its jaws together with a noise like that of cablangettes. Daudin relates the following circumstance, communicated to him by a Dutch naturalist, who resided several years in India. "When we landed in Table bay, we took several hawk's-bill turtles (tupinambis), whose whole flesh was filled with marine plants, and thick shells, which they easily break down with their strong jaws. Three, which could not be brought on board, were tied to the trunk of a tree, with a thick cable, but when the sailors returned on the following morning, they found that these turtles had contrived to turn over on their bellies, and had then cut, with their gums, the cables with which they had been fastened." Hilt. Nat. des Réptiles, in the edition of Buffon, by Souvini, t. i. introduction, p. 38.

The two jaws are not moveable in all the serpents. They may be divided into three orders. 1. Those with the branches of the lower jaw consolidated, and consequently not possessful any power of thrusting forward the upper jaw, or moving it laterally. 2. Those with the branches distinct, and united in the recent flat by an elastic ligament. There are two modifications of the latter; they may either have merely the power of separating the two jaws; or they may, at the same time, separate the jaws, and carry forwards a part, or the whole of the upper. We shall speak of the motions of the jaws according to this division, first describing the bones, and then the muscles.

*The Bones.*—In the serpents, with the lower jaw consolidated, the head is shaped nearly as in the lizards. This is the case in the anguis and amphibian, the axilla, aerochordus, and hydrophis. In the genus anguis the head very closely resembles that of the iguana. The arch of the upper jaw
jaw is uninterrupted, and conforms to the curve of the lower; the concavity of the palate is nearly complete in front. The palatine arches are directed backwards, and united to the condyloid pedicle of the temporal bone. This pedicle is short, and nearly vertical, and excavated behind for the attachment of the digastric muscle. The lower jaw has a small process behind its articulation for the attachment of the muscles, which depress it; and another towards its posterior third portion, analogous to the coronoid, for the elevating muscles.

In the amphibia, although the general configuration is a little changed, nearly the same arrangement is met with. The whole upper jaw is left separated from the cranium; the concavity of the palate is nearly complete. The palatine arches are much larger. The condyloid pedicle of the temporal bone, instead of being vertical, is continued nearly horizontally forwards. In proportion to the cranium, the lower jaw is much shorter; and it is articulated to the condyle by its posterior extremity. It is very wide behind, to produce the coronoid process. The orbit and temporal fossa are completely conflended; they are bounded by prominent bony cristas, as in the carnivorous mammals; hence, on first view, the head of an amphibia might be supposed to belong to one of the choristoptera.

The serpents of the second kind, whose lower jaw is formed of two distinct branches, and in which the upper is capable of being separated, but not carried forwards, are all the non-venomous colubres, and the boa. The configuration of the upper jaw, in the latter, is very different from that of the lizards, although the bones are nearly the same, as we shall explain in the osteology of the head. The ossa incisiva are not always furnished with teeth; sometimes even, as in the boa, they do not unite the superior maxillary bones. All the other bones of the jaw are movable on the cranium, which serves merely as a point of support.

The superior maxillary bones are two long branches, in which the teeth are implanted; they form the outer edge of the palate. They are articulated by two points; first towards their middle, as a lever of the first kind, on a small bone analogous to the os male, and forming the anterior edge of the orbit: nearly at the same point, but towards the inner side, the superior maxillary bone has a process, which slides in a groove, and reits on the palate arch. It moves on these two surfaces, playing backwards and forwards. The anterior extremity of this upper maxillary bone is free: the posterior receives the end of a particular bone, serving to unite it to the palatine arches.

The palatine arches are the two internal bony branches themselves, formed of two parts. An anterior, which is free in front, and articulated by three points; behind, with a bony branch, which proceeds towards the extremity of the lower jaw within its articulation, and appears to form a continuation of it; on the outside, with a particular bone, uniting it to the maxillary arch; and above, with the basis of the cranium, in front of the orbits. The posterior portion of the palatine arch is analogous to the pterygoid alae or laminae. It is articulated by three points; first, in front, with the posterior extremity of the first portion; second, behind, with the lower jaw towards the inside; third, on the outside, and towards its anterior part, with the bone uniting it to the maxillary arch. Lastly, the third palato-maxillary is a piece nearly cylindrical in its middle, flattened and widened at its two extremities, by which it is supported, being articulated on the outside, to the posterior extremity of the maxillary arch, on the inside, towards the middle and outside of the pterygoid portion of the palatine arch.

In consequence of this singular formation, the whole upper jaw is, as it were, supported and distinct from the cranium, and influenced by the motions of the lower jaw. When the posterior extremities of the latter are separated, the pterygoid arches are moved apart. They carry with them the posterior extremities of the palatine and maxillary arches, while at the same time the anterior extremity is moved backwards. On the contrary, when the two internal edges of the pterygoid laminae are brought together, or, what is the same, when the articulation of the lower jaw tend to approximate, the anterior ends of the palatine and maxillary arches are carried outwards, and separate from each other.

The serpents of the third order, which have jaws susceptible of separation, and which at the same time may carry forwards the superior maxillary bones, properly so called, exhibit but a slight modification of the structure described as belonging to the preceding division. Their pterygoid arches are articulated with the lower jaw, towards its extremity, on the gullet, as in the Caudata. They also receive the bone which is to join them to the palatine arches; but the latter are very short, directed forwards, and only containing venomous teeth. This intermediate bone, therefore, goes above the superior maxillary, which is itself articulated in the front of the orbit, or the short and movable cheek-bone. When the lower jaw is moved forwards, the palatine arch, carried in the same direction, drives before it the bone which joins it to the maxillary. The latter, extremely movable, is immediately turned up, or carried forwards, by moving on the cheek-bone, which causes a complicated series of motions.

The articulation of the lower jaw is the same in the whole family. The temporal processes are prolonged posteriorly: they receive an intermediate bone; analogous to that designated by the name quadratum in birds. This bone is very short, and possesses little motion, in the species which have the upper jaw fixed, and the inferior consolidated.

It is directed forwards in the amphibia, towards the lower jaw, which is shorter than the cranium by nearly one-third;—a circumstance which belongs only to this species. In the anguis, the os quadratum descends much more obliquely forwards.

In all the other species the bone last-mentioned is much longer. It sometimes descends perpendicularly, as in the boa; but it is commonly directed backwards, as in most of the colubres. The temporal extremity is generally widened and excavated by a small depression. The inferior extremity is rounded like a condyle, and received into an excavation of the posterior extremity of the corresponding branch of the inferior maxillary bone.

From the nature of its articulation, the lower jaw of either side is not only susceptible of elevation and depression, so as to open and shut the mouth, by playing on the os quadratum, as is the case only in the genera amphibia and anguis; but it may also be carried outwards, and take with it the os quadratum, as is the case in the colubres and venomous serpents, whenever the pterygoid arch is moved forwards. That is to say, whenever the upper jaw is widened, the inferior must follow its dilatation, because the posterior extremities of the pterygoid arches, being articulated with the internal part of the lower jaw, it must move together with them. The arrangement of the muscles accords very well with this formation, as we shall proceed to describe.

Mammals of the Jaw.—The maxillary muscles of the genera anguis and amphibia, and probably of all the serpents with a consolidated under jaw, resemble those of the common
common lizard: but they are very different in those whose lower jaw consists of two distinct pieces: we shall describe them in the rattlesnake.

Here the muscles of the lower jaw are concealed in the lips, and go round the mouth on each side. That which forms the anterior edge of the commissure of the lips is the strongest, and seems to hold the place of the malleus. It arises by firm epineurofcs from the tendinous sheath, which contains the venous gland. Its fibres form a considerable cord, which constitutes the whole thickness of the lower lip, and are inserted in the upper edge of the inferior maxillary branch for almost two-thirds of its length.

The muscle immediately behind is analogous to the temporal, and is much flatter than the preceding. It is a muscular falcatus, of which the superior extremity is fixed to the temporal excavation behind the orbit, and the inferior, after going backwards behind the commissure, is confined with the inferior of the latter muscle. It is obvious that the contraction of these two muscles must approximate the jaws, and thus close the mouth.

In the commissure of the lips, and behind the two last muscles, we see another resembling them in form, but much shorter. It occupies the inferior part of the os quadratum, and about the posterior third of the jaw, at the outer edge of the dental canal. It is an accessory muscle to the temporal and malleus.

The muscle corresponding to the digastricus occupies the whole length of the back of the os quadratum, and terminates at the posterior apophysis of the maxillary branch beyond and behind its articulation.

The muscles moving the upper jaw are more numerous. One arises, by epineurofcs, from the capsule of the joint, between the maxillary branch and the os quadratum, and passes forwards and upwards towards the back of the venous teeth, being partly expended on that back, and on the posterior apophysis of the superior maxillary bone. Its use is evidenced by the movement of the venous teeth, when they have been elevated.

Two other muscles act on the pterygoid and palatine branches. Both are situated between the middle line of the basif crani and the palatine arches. The lower, situated immediately under the skin in the palate fosa, is a plane of elongated fibers, occupying the middle line of the cranium, and going backwards to the internal surface of the bony pterygoid plate, which it will carry forwards and downwards, so as to protrude the superior maxillary bone, and elevate the venous fangs, at the same time contracting the mouth by the approximation of the two internal arches.

The other muscle, flatterer, and placed above the preceding, towards the base of the skull, extends from the anterior portion of the palatine arch, and the whole length of this arch, to the middle of the basif crani, crossing the direction of the left muscle, on which it is placed. When it contracts, it carries backwards the whole mass of the upper jaw, at the same time approximating its two branches.

By means of this mechanism, serpents can twist their mouths in seizing objects, and dilate them extraordinarily, so as to swallow animals larger than themselves. Their teeth serve merely for holding their prey; and the muscles moving the bones, in which these teeth are implanted, cannot move them in such a way as would be necessary for mastication, but merely depress, elevate, approximate, separate, protract, and retract them.

Lacépède thus describes the motions of the jaws in serpents. "While the teeth of one side are fixed in the prey which the animal has seized, and are therefore motionless, those of the other side are carried forwards, penetrate the animal, drag it towards the throat, and there fix it in their turn; when the opposite ones are again advanced to repeat the same process on their side. By these repeated alternate motions of the two sides of the jaws, combined with their lateral expansion, serpents are enabled gradually to swallow animals of a diameter exceeding their own." Ht. Nat. des Serpens.

The Teeth.—Their structure has nothing peculiar in reptiles. The bone is compact and hard; the enamel thin; and, as they are always thin, there is none of the third substance called by Cuvier the cement. We are not acquainted with any facts concerning the succession of the teeth in reptiles;—whether they have two sets, or, that the first grow constantly, or that the jaws are elongated anteriorly, &c. The crocodile forms an exception to this remark; we are indebted to Cuvier for a very interesting account of the succession of their teeth, which we shall state presently.

The chelonian reptiles, like birds, have no teeth, properly so called; the horny substance encasing their jaws, and supplying the place of teeth, will be described at the end of this account of the teeth of reptiles.

The saurians, ophidian, and batracian reptiles may be compared to the cetacea; as they do not masticate their prey, the teeth are calculated merely to hold, and not to divide it; hence they have much less influence on their economy than those of virivorous quadrupeds. They accord, however, tolerably with the natural genera and subgenera. "They are almost always the same in all parts of the jaw, so that they admit of division into different classes, according to their configuration, only in very few species.

Sometimes they are attached to the two jaws only, as in the mammalia: this is the case with the saurians (excepting only the iguana, which has palatine as well as maxillary teeth); sometimes they are implanted also in the palate, as in the ophidian, with the single exception of the amphibia. Their number is of less importance; first, because it is considerable, and not accurately determined; secondly, because they fall out without any hitherto ascertained regularity, either in situation or time.

Teeth of the Saurians.—In the crocodile the enamel is more or less triturated longitudinally. The upper and lower teeth crowd when the jaws are shut. They are all conical, hollow, generally a little curved, and marked with two longitudinal projecting lines; an anterior and a posterior one. The five or six posterior teeth on each side are more obtuse and comprised than the others.

In a living crocodile, which Perrault observed at Versailles in 1681, he found that all the teeth were slightly bent towards the throat, and that this curvature was the most conspicuous in those near the end of the snout. When the jaws were drawn together, the teeth of each jaw pilled into the intervals between those of the other, so that an uninterrupted series was visible, as there are no lips to hide them. He says further, that the points of the upper teeth entered into excavations of the lower jaw.

The following account is derived from Cuvier's Observations sur l'Osteologie des Crocodiles vivans, in the third volume of the Annales du Muséum. "The number of the teeth does not change with the age of the animal: a crocodile quitting the egg has the same number as one twenty feet long. I have ascertained this fact in a series of heads from an inch to two feet long. The back teeth may be a little concealed by the skin of the gums. The interior is always hollow, although
although the teeth, as in all other cases, are formed by successive frata.

"The capsule containing the new tooth is not enclosed in a separate cell of the maxillary bone, as in the mammalia, but it lies in the bottom of the socket of the tooth which it is designed to succeed. This little shell is first on the internal surface of the root of the tooth in place; it occasions a groove in this part, by which, as it increases in length, it penetrates into the hollow of the latter, and then destroys by its pressure the pulp that filled its cavity, and furnished the materials of its increase. Hence, at whatever age we may remove a crocodile's teeth, we shall find, either in the alveolus, or in the cavity of the tooth itself, a small tooth, either in the form of a thin and short shell, or more advanced and ready to occupy its place, when the old and enveloping tooth shall have been discharged. This succession seems to be repeated as long as the animal lives: hence the teeth always appear sharp and fresh, and although larger, they are not much more worn in old than in young crocodiles. I have ascertained all these facts in a recent head, and in others preserved in spirits of wine: and I could distinguish very clearly pulps and capsules similar to those of quadrupeds.

"This process was tolerably well understood by Perrault and Duverney; Mem. pour fervir à l'Histoire des Animaux, v. iii. p. 167.

"As the teeth of the crocodiles are generally nearly perfect cones, and enlarge to their very basis, how can they come out of the alveoli, of which the entrance is much narrower than their base? The new tooth, as it is developed and fills the cavity of the old, compresses its substance against the socket, destroys its confidence, makes it crack, and thus disposes it to be separated on the slightest shock at the level of the gum. The fragments are easily thrall out of the sockets. We often find in the sockets of crocodiles, when changing their teeth, rings formed by the relics of the old teeth left behind, through which the new are making their way: and such are also found in the fissional jaws of true crocodiles.

"The base of the cone is generally not entire, but exhibits a more or less deep fissure on its internal side; it has been already mentioned that this is caused by the pressure of the germ of the new tooth. While the germ is very small, this fissure does not exist, and the germ itself never exhibits it.

"Although the teeth may be said to be all alike, and arranged in an uniform series, some are rather larger than the rest; and the greater this inequality, the more irregular is the line of the jaws.

"These larger teeth are either received into grooves of the opposite jaw, or into holes, or they perforate it completely.

"In the caimans or alligators, the first of Cuvier's subgenera, (containing the American species,) there are from nineteen to twenty-two teeth on each side below, and nineteen or twenty above. The two first of the lower jaw penetrate at a certain age the front of the upper jaw, and go completely through it. The fourth of the same jaw are the longest, and go into the holes of the upper jaw, in which they are entirely concealed when the mouth is shut. The five front in the upper jaw are intermaxillary teeth.

"The first and fourth of the lower jaw are long in all the three subgenera; next to these come the eighth and ninth of the upper, the eleventh of the lower jaw in the true crocodiles and caimans. The caiman with bony eye-lids (crocodilus palpebrofus) has the twelfth below and the tenth above the longest. After the fourth in the gavials (longirostres) they are all nearly equal, so that the jaws in these have not so waving a line as in the other subgenera.

"The fourth tooth below might be called canine, from its superior length, and because it corresponds to the future between the maxillary and intermaxillary portion of the upper jaw.

"In the second sub-genus, or proper crocodiles, there are fifteen teeth on each side below, and nineteen above. The first of the lower jaw penetrate the upper; the fourth pass into grooves, and are not lodged in cavities of the upper jaw.

"The gavials (longirostres) have 25—27 on each side below, and 27—28 above. The two first and the two fourth of the lower pass into grooves, not into perforations or cavities of the upper jaw.

In the tupinambis of the Nile we find sixteen above, of which five are intermaxillary, thirteen below; all conical, and slightly bent backwards: the posterior are the largest and most obtuse. In a tupinambis from the Moluccas there were six above, and seven below, all compressed and pointed.

The teeth of the common lizard, the iguana, and agama, are cutting, and more or less serrated on the edges; they are all fo in the iguana, where several have six or eight denticulations, and there are twenty or twenty-one teeth on each side. The common lizard has twenty-one or twenty-two, but the anterior are not feebly denticulated, and the others have merely a groove. The agama has nineteen or twenty, all with three denticulations. In these three genera they increase in size from before backwards.

They are triangular, with a little groove before and behind, in the flélie; there are sixteen or seventeen such on each side, and two large conical canine teeth. There are, moreover, two small conical intermaxillary teeth above, to which nothing corresponds below.

The dragon corresponds to the flélie in its teeth, except that the canine are proportionally longer than the incisors: the number is the same. There is a good representation of them in Blumenbach, Abbildungen Natur-Historischer gegen-stande, No. 98.

The gecko has thirty-five or thirty-six teeth on each side, all of equal size, close, simple, slender, and pointed. The flat-headed gecko has seventy or seventy-four on each side. There are twenty-two on each side, above and below, in the scik, all conical, short, closely set, and of equal size.

The cameleon has, on each side, eighteen above and nine-teen below; of which the anterior are very fine, the posterior much larger, and furnished with three points.

**Teeth of the Batracians.** — All these have teeth in the palate; as to the jaws, the salamanders have them in both, the frogs in the superior only, and the toads in neither.

The palateal teeth form, in the toads and frogs, a trans-verve line, interrupted in the middle. They are implanted in the palate bones. They form two long parallel lines in the salamander.

The maxillary teeth are small, pointed, and closely set. The frog has about forty on each side above, eight of which are intermaxillary; the salamander sixty, both above and below, and thirty on each side of the palate.

**Teeth of the Ophidians.** — The serpents are divided first into two families, those which can, and those which cannot, separate the two halves of the upper jaw. The former have no incisor teeth; but they have palateine, maxillary, and
mandibular, or teeth of the lower jaw. The latter, having all the edge of the upper jaw furnished with teeth, possefs, consequently, a kind of incisors.

The second family includes only the angues and amphifenae. The former, besides the conical slightly curved teeth of uniform size, which they have in both jaws (eighteen or twenty above, and fifteen or sixteen below on each side), possefs others, very small and short, arranged in two rows, on the posterior half of each palatine arch.

The other family is subdivided into two tribes, the venomous and the non-venomous. In the latter there are conical, curved, and very pointed teeth, directed backwards along each maxillary, palatine, and mandibular arch; consequently there are four rows in the upper, and two in the lower jaw, all nearly longitudinal.

On the maxillary branch of the venomous serpents there are only the hollow fangs, attached to the anterior extremity only; consequently, with the exception of these fangs, there are only the two palatine rows above, and the two rows of the lower jaw below.

The following is a table of the numbers of teeth on each side in some species.

<table>
<thead>
<tr>
<th>Names</th>
<th>Incis a Teeth</th>
<th>Maxillary</th>
<th>Palatine</th>
<th>Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boa constrictor</td>
<td>2</td>
<td>18</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Coluber molurus</td>
<td>0</td>
<td>18</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Coluber nafica</td>
<td>0</td>
<td>16</td>
<td>of which the anterior are the largest.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>of uniform size; very small.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coluber natrix (common snake).</td>
<td>0</td>
<td>18</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the posterior largest.</td>
<td></td>
</tr>
<tr>
<td>Rattle snake (crotalus horridus).</td>
<td>0</td>
<td>1</td>
<td>14</td>
<td>5 or 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and several rudiments not fixed.</td>
<td></td>
</tr>
<tr>
<td>Coluber haje</td>
<td>0</td>
<td>the same.</td>
<td>25</td>
<td>12—14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and a parallel row of small ones.</td>
<td></td>
</tr>
<tr>
<td>Coluber naja</td>
<td>0</td>
<td>the same.</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the same.</td>
<td></td>
</tr>
<tr>
<td>Anguis fragilis (blindworm).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibozma fuliginosa</td>
<td>on each side, and a middle one.</td>
<td>5</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

To this table, which is derived from the Leçons d'Anat. comp. of Cuvier, we add a second, drawn up by Palefot Beauvois, a French naturalist, who spent many years in America, and whose observations on serpents are inserted by Daudin in the fifth volume of his Natural History of Reptiles.
## REPTILES.

Comparative Table of the Teeth of several Serpents of North America, by Palisot Beauvois.

<table>
<thead>
<tr>
<th>Names of the Species</th>
<th>Upper Jaw.</th>
<th>Lower Jaw on each Side</th>
<th>Total Number of Teeth</th>
<th>Food.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fangs on each Side</td>
<td>Common Teeth on each Side</td>
<td>Internal Branch on each Side</td>
<td></td>
</tr>
<tr>
<td>Crotaulis durifus.</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Cr. rhombifer.</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Cr. miliaris.</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vipera berus.</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>44-48</td>
</tr>
<tr>
<td>Coluber hectorodon (hognose-snake).</td>
<td>13</td>
<td>the two lower ones three times larger.</td>
<td>14</td>
<td>80-86</td>
</tr>
<tr>
<td>Col. erytrogrammus.</td>
<td>0</td>
<td>10</td>
<td>15-16</td>
<td>70-76</td>
</tr>
<tr>
<td>Col. constrictor.</td>
<td>0</td>
<td>12</td>
<td>28-30</td>
<td>112-120</td>
</tr>
<tr>
<td>Col. getulus (chain snake).</td>
<td>0</td>
<td>8</td>
<td>18-20</td>
<td>72-80</td>
</tr>
<tr>
<td>Col. fasciatus.</td>
<td>0</td>
<td>8</td>
<td>20-24</td>
<td>80-94</td>
</tr>
<tr>
<td>Col. fulvius.</td>
<td>the teeth not ascertained.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col. furita.</td>
<td>the same.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Venomous Teeth and Gland.**—We have stated that the innocent serpents have teeth along the maxillary edge of the upper jaw, and in the palate; that is, four parallel rows, two external or maxillary, two internal or palatine. The venomous kinds, instead of the maxillary rows, have the venomous fangs at the anterior end of each superior maxillary branch; and they pofsses the palatine rows, as well as the innocent serpents. There is no difference in the teeth of the lower jaw. The venomous fangs are much longer and thicker than the other teeth: they are conical, sharp-pointed, and perforated by a fine tube. They are movable at the will of the animal, and can be drawn up from the jaw, or laid down at pleasure. They are contained in a kind of cavity formed in the gums, from which their point projects.

At the end of his account of Indian serpents, Ruffel has given two finely engraved plates, representing the appearances of the teeth in the venomous and innocent species. In the coluber catenularis (tar-tutah), an innocent serpent, there are two marginal or maxillary rows of simple teeth, and two palatine rows. The vipera elegans (katukah-rekula-podah) has also two palatine, but no marginal or maxillary rows. The teeth are surrounded by a fringed membranous covering, which almost conceals them. The points alone appear, when the membrane is not entirely depressed. At the anterior end of the maxillary bone, on each side, is a large membranous face, wrinkled, and containing the fangs. The vipera naja, or speckle snake, has the palatine teeth, and two venomous fangs, like the last; but the teeth are smaller, the fangs shorter, and the membranous face less apparent. The bungarum-pamah, a species of bungurus, has the palatine teeth, two fangs still smaller than in the speckle snake, and at the edge of the mouth, behind the orifice of the bag including the fangs, three small teeth on each side, which may be considered as an imperfect maxillary row.

In the vipera elegans, the fang is fixed to a bony basis, which is attached to the superior maxillary bone: this basis is much longer in the speckle snake, and has attached to it the three small simple teeth already mentioned.

Behind the venomous fangs in the vipera and other serpents, are other smaller fangs, said to be designed to replace the former when they are lost. Blumenbach has given an excellent delineation of the mouths.
mounds of the boa constrictor and the crotalus horridus, in his Abbildungen Natur-Historischer gegenfände, No. 37, to shew the difference between the venomous and innocent kinds; an object of the greatest importance, both with regard to the fewer species of the former, and to the much more numerous of the latter kind, in order to warn mankind against real danger, and prevent them from groundless terrors. "All serpents (says Blumenbach), whether venomous or not, have the double internal row of palatine teeth, and the inferior maxillary teeth, in common. But the venomous species have moreover the whole outer edge of the upper jaw furnished with teeth; in the venomous kinds, this is toothless. But the latter have, at each anterior corner of the mouth, attached to the upper jaw, the long hollow fangs with a flit at their point. These are connected with the venomous glands, of which they may be regarded as bony excretory ducts, to convey venom into the wound made by the bite.

"When, therefore, we see in any snake four rows of teeth in the upper jaw, viz. besides the two internal palatine rows, an external row on each side running to the corner of the mouth; we may be sure that the species is poisonous, and so far innocent."

The poisonous gland, peculiar to the serpents with fangs, and said to be of the conglomerate kind, like the salivary glands of the mammalia, is situated on each side, behind the orbit, close to the branch of the superior maxilla, and almost immediately under the skin. It is covered by a membranous or aponeurotic semitransparent sheath, fixed to the bones of the head in front of the gland. The excretory duct extends from the anterior part of the gland, immediately under the orbit, to the bony basis of the fang, and opens into a canal excavated in the fang, running through it from above downwards, and terminating by an oblique aperture on its anterior surface. Two muscles defined to elevate the fangs, to depress the superior maxillary bones, and consequently to close the mouth, pass along these bones from before backwards; one on the outer, and the other on the inferior side of the gland. These cannot act without compressing the gland, and expelling its secretion into the excretory duct. See a representation of the gland and the surrounding muscles in the coluber naja, Phil. Trans. 1804, pt. 2. pl. 8.

In the article Poison of this work, there is an account of the appearance and sensible properties of the fluid secreted by the venomous gland of the viper, and of its effects on animals. We have a few additional points to mention on this subject, as well as concerning the poisonous properties of some other serpents.

Fontana affirms, that the noxious qualities of the secretion are retained for a long time, even in a dry state; and that perfolia have suffered from wounds inflicted by the fangs of vipers, and other venomous serpents, preferred in spirits or dried, even years after the death of the animal. The venom retains its colour and transparency in the dead tooth, and is still active enough to kill animals, if it be rendered fluid by immersion in warm water. He also found it active after many months, when dried and powdered.

Leeches, snails, and slugs, were not injured by the venom of the viper. The blindworm and common snake were not affected. Of tortoises, some were inoffensive to the bite, others died at the end of some hours, when bitten by several vipers.

The bites of the vipers of these climates produce more or less alarming symptoms in the human subject, but are not attended with danger. A peafant, bitten by a viper in the little toe, had the foot, leg, and thigh swollen in fix hours; the pulse small and intermittent; there was head-ache, pain in the abdomen, latitude, and oppression; he cried frequently and had no appetite. He gradually recovered in two days, under the use of vegetable decoctions and poultices, which probably did not contribute much to his restoration. Daudin, Hist. Nat. des Reptiles, 8vo. introd. p. 138.

Lepchañ mentions the circumstance of a young Basckskr, ten years old, being bitten by a black viper (coluber pretter, L.) in the foot. "Son pied enfla extrêmement en moins d'une demi-heure, et il éprouvait tant de douleur dans la partie blessée, qu'il ne pouvait pas remuer le pied sans être forcé de crier: la pâleur extrême de son visage, ses yeux troubles, et sa respiration gênée, annonçaient très-fortement le danger que couroit ce jeune homme, si l'on n'y apportoit un prompt remède." Olive oil externally, and volatile alkali by the mouth, were the successful remedies. Daudin, v. 6. p. 168; (quoted from Lépchañ, Tagebuch einer Reise, &c. t. 2. p. 105).

While Charas was engaged in researches for his work on the viper, he was bitten in the fore-finger. He immediately sucked the wound, made a ligature on the root of the finger, and another on the wrist. The bite gave him but little pain. He took some fumori, which operated in a few hours, and he was cured.

Boyle says that he cured a man bitten by a viper, by holding a red-hot iron near the wound for a quarter of an hour. The truth seems to be, that the effects of the bite are not confiderable in the human subject; and this accounts better for the recovery of persons bitten, than any virtues in the remedies employed.

The wounds inflicted by these animals are not, however, always to be free from danger. The viper chernea (coluber chernea, L.), favs Daudin, is very venomous, and its bite is often mortal. Linneus employed olive oil in the case of a woman who had been bitten; but the died, although the remedy had been successfully employed in the bite of the black viper (viper pretter). Daudin, v. 6. p. 148.

The wounds of many Indian, African, and American serpents, are, however, fatal to the human subject. The vipers conunata of southern Africa, is describ'd by Pateron as very virulent, infomuch, that the Bossefins and Namaquaws employ its venom for poisoning their arrows. Daudin, ibid. p. 189.

A captain Hall made some experiments on the poisonous powers of the rattlesnake, of which he has recorded the results in the Philosophical Transactions. The first dog bitten by this animal died in fifteen seconds; the second at the end of two hours; and the third of three hours. He recommenced his experiments with the same serpent on the following day; the first dog died in thirty seconds; another in four minutes. Three days after, a frog died in two minutes, a chicken in three minutes. A little time after, an amphibian was bitten, and died in eight minutes; and the serpent, having subsequen'tly bitten himself, died in twelve minutes.

Sir Everard Hume has described at full length the case of a man, who was bitten on the thumb and fore-finger by a rattlesnake between four and five feet long in this country. He died eighteen days after the accident. Great swelling of the whole limb up to the axilla ensued; the tumefaction did not extend to the neck, but there was a fullness down the side, and blood was extravasated as low as the loins, producing a mottled appearance. A full trial was given to the volatile alkali, both externally and internally, and to other medicines of the like nature, as ether, brandy, &c. also to opium. The cellular substance had flought over the whole swollen part of the limb, so that the skin was separated universally from the muscles. For a further account of this case, and
and of some other cases of bites of East and West Indian serpents, see the Phil. Trans. for 1810, p. 75.

Ruffel, in his account of Indian serpents, has furnished us with the most ample and interesting details concerning the Indian poisonous serpents. Of these the cobra de capello, or fpectacle snake (coluber naja), and the kataka-rekula-poda (vipera elegans), are the most dangerous. It appears, from a comparison of the effects of the venom of the Indian serpents, the rattle-snakes, and the viper in the mammalia, that the symptoms are nearly the same in all, but that the term of their duration differs. The bite of a rattle-snake destroyed a dog in England in two minutes; while that of the most venomous Indian snake has never been fatal to this animal in less than thirty-seven minutes. A chicken bitten by the gedi paragoodoo (bungarus carleeus) was immediately affected with stupor; in ten minutes, it was incapable of remaining upright; a quarter of an hour after it was stretched on the ground, as if asleep; it made some efforts to rise, turning the head to one side and the other, became convulsed, and perished in half an hour.

A stout dog was bitten in the thigh by a serpent of the same species: he howled much from the bite, but walked about freely. He lay down in a quarter of an hour, and howled; when an attempt was made to make him stand by raising him up, it was found that the hind limbs were paralyzed. He grew worse, ceased to howl, and vomited abundantly; he became benumbed, and remained lying on the side. He died in two hours, having had very bad convulsions.

A lean bitch, having been bitten near the groin, remained fifteen minutes without exhibiting any symptoms of suffering. In fifty minutes she lay down, and appeared much affected: on attempting to make her stand, it was discovered that the limbs were paralyzed. She vomited a little, and was convulsed till death, which occurred seventy minutes after the bite.

Wounds inflicted by the spectacle snake, or coluber naja, had the same effects; also those of the katuka rekula poda. Death did not always follow in the latter case, particularly in a dog, who was bitten six times, and once inoculated with the poison. A horse was bitten by the last-mentioned snake on each side of the nose. Prodigious swelling ensued, and extended to the throat; the animal refused his food, vomited, and appeared greatly affected. He had an emollient fermentation, and recovered on the third day.

Experiments with the bodrou pam had the same results: swelled, numbness, paralysis, convulsions, and death.

Ruffel tried inoculation of the venom with needles, thread, &c. Of fix trials on dogs, none proved mortal. Eight out of twenty-four were fatal in chickens and pigeons.

Several venomous and innocent serpents were exposed to the spectacle snake: it would not bite them until infligited to do it, and they died without attempting to retaliate. But Ruffel found, in repeated trials, that two of these animals did not hurt each other; they would fight, and wound each other, but these wounds were not mortal.

Many circumstances modify the results of wounds inflicted by venomous serpents: viz. the quantity of venom, the condition of the serpent as to vigour or weakness, the number of bites he has inflicted, the situation and nature of the part bitten, the size of the animal, &c.

There are many facts to prove, that the secretion of the venomous gland, which is so active a poison, when introduced into a fresh wound, is quite innocent, and probably inoperative, if taken into the stomach. The pflyl, or serpent charmers, so celebrated among the ancients for curing persons who had been bitten by vipers, sucked the wound strongly and repeatedly. Recent wounds made by the fer de lance (vipera lanceolata) of Martinique, the venom of which is very active, are also sucked with impunity. Fontana swallowed the poison of the viper, both mixed with water, and pure; it had even a mild taste, instead of producing a caustic and burning sensation, as some have stated. The heads of vipers, with their fangs and glands entire, have been eaten by dogs without any ill effects; and even the head of the terrible rattle-snake, with all its venomous apparatus, has been employed, with the rest of the body, in making foup, which has been drunk with perfect impunity.

Having thus described the instruments with which nature has furnished the venomous serpents, for the purpose of attacking, killing, feizing, and swallowing their prey, we cannot be at much loss to understand how these objects are effected; yet the prevailing notions on the subject are calculated, instead of elucidating, to involve a plain matter in obscurity and mystery. These will be most effectually dispelled by the following statement of Paliot Beauvoir, who had considerable opportunities of observing the habits of serpents in America. "Much has been written on the manner in which serpents seize their prey: some ascribe to them a kind of magical power, the effect of which is to charm and enchant the animals on whom they fix their looks; others, lefs fond of the marvellous, pretend that they inflirem with excessive alarm, that, not knowing what they do, they run from one side to the other, fly, return, and at last precipitate themselves into the jaws of the monster; a third opinion is, that serpents diffuse around a fetid odour, by the aid of which they suffocate birds, squirrels, rabbits, and the different animals on which they feed. It must be difficult to determine the means employed by these animals in a state of nature, for the purpose of seizing their prey; and it would probably be wrong if we were to suppose that the same means are adopted in all instances. Can we believe, for example, that the black serpent (coluber coniurifer), which creeps with astonishing quickness, climbing shrubs, and not at all venomous, should employ the same means as the boi-quiras (crotalus durifius), a slow moving animal, never ascending the smallest plant, and furnished, like all the venomous serpents, with two fangs, the wound of which is so quickly fatal? Yet, if we may judge of these reptiles in a state of liberty, by what goes on when they are prisoners, they certainly create only a common alarm, such as any creature will feel, when endeavouring to escape from its enemy. The animals experience no enchantment, nor any attack of madness, when a serpent fixes his eyes on them. Serpents produce no bad smell, fill less a fetid vapour, capable of suffocating animals. The boi-quiras eats indiscriminately all the dead birds brought to it. It will not eat frogs, which the black serpent, on the contrary, seems to prize highly. Fascination and charms are repugnant to reason; for cerers and magicians exist no more among animals than men; cunning, address, and force, are in both cases a sufficient, as well as the only charm and power, to render the weak tributary and vic- tim to the strong.

"I made, in conjunction with Peale, the following obser- vations on a boi-quiras, which he had preserved alive for five years, and on a black serpent.

"A living bird (icterus phenicus) was put into the cage with the rattle-snake, and remained there two days, without any offensive proceeding on the part of the serpent. The bird did not seem at all uneasy. As far as we could judge from the countenance, the air which it breathed was the same as it would be in an ordinary closed cage. During the two days, the reptile ate a dead bird of the same species
as that in the cage, which he never offered to touch. Another living bird, the loxia cardinalis, instead of being frightened by finding himself in company with the boiquira, amused himself with pecking at the cage, and eating millet-feed thrown into him; he changed his situation frequently, and would even perch on the reptile's back; but he moved off at the sound of the rattle. Several kinds of frogs, living and dead, were presented to the same serpent; but he touched none. The black serpent, on the contrary (coluber constrictor), attacked the frogs immediately, and seemed to prefer the tree-frogs. He also swallowed flies and other insects.

"A common rat was put into the cage with the boiquira, who immediately appeared animated; the rat, frightened, ran towards the side opposite to the reptile. The chafe lifted a few seconds, the animal using every effort to escape, when the reptile, perceiving a favourable moment, flew at his prey, and bit it. The rat continued to run round the cage, but the serpent remained quiet: the former, in about a minute, swelled, became convulsed, died, and was swallowed by his enemy. The convulsions were probably considered by old observers as the effect of the charming power of the serpent, or of extraordinary fear; but they are a regular symptom of the action of the poison.

"Perhaps these experiments do not determine exactly the means which serpents employ for feizing their prey, so likely to escape them by running or flying; but they seem sufficient to authorize us in rejecting all ideas of fascination, or charm, of extraordinary terror or suffocating vapour. On the latter point, I can state, that nine boiquiras were kept for three weeks in the same box; when it was opened, at the end of this time, no particular odour was observed." Dr. Daudin's Hist. Nat. des Reptiles, in the edition of Buffon, by Sonnini, v. 5. p. 55. et seq.

Those serpents which have not this quick and effectual means of destroying their prey by the poisonous apparatus, accomplish their object in another manner. They throw themselves on the animal which they attack, twine round his body and limbs, and exert, in this manner, a compressive force capable of breaking the bones. When he is thus disabled from resistance, they swallow him gradually as the way already described. The enormous serpents of Africa and America, thirty or forty feet long, are strong enough to attack and overcome the larger animals, and can then swallow them entire. See the account of the boa aboma by Stedman, in his voyage to Surinam and Guiana; and of the boa constrictor, in Adanson's Voyage au Senegal, p. 152. et seq.

**Proportion of the venomous to the harmless Serpents.**—The number of serpents polluting venomous fangs is more considerable than has been generally supposed. "Ne teles horrentibus," says Lamennas, "excelsiblirvenionisiimmensus, decimam quamque tantum speciem armavit imperans, et vertipelles eos voluit, ut dubii omnes metuentur abs omnibus." Yet Dr. Ruffel found seven venomous species among forty-three, which he observed; and the proportion of the venomous to the non-venomous kinds, among the serpents described by Daudin, in his History of Reptiles, is as 80 to 253. There are not more than 14 or 16 genera of serpents indigenous to Europe, yet among these are five vipers. Of the species described by Daudin, 201 belonged to the ancient, and 112 to the new continent: the venomous kinds formed a fourth in the former, and a fifth in the latter.

Daudin gives the following lists of the poisonous and harmless kinds.

### Genera with poisonous fangs.

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<th>Species</th>
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<td>1. Bungarus</td>
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<td>2. Acanthurus</td>
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<td>3. Crotalus</td>
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<td>4. Scytale</td>
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<td>5. Lachesis</td>
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<td>6. Cenchrus</td>
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<td>7. Vipera</td>
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<td>8. Platurus</td>
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<td>9. Langaha</td>
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<td>10. Clithonia</td>
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<td>11. Hydrophis</td>
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### Genera without poisonous fangs.

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<td>1. Boa</td>
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<td>4. Hurria</td>
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<td>9. Anguis</td>
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<td>10. Ophidium</td>
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<td>11. Pelamides</td>
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<td>12. Acrophorus</td>
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<td>13. Amphribas</td>
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<td>14. Cacilia</td>
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See his Hist. Nat. des Reptiles, v. 5. p. 22.

The following is given by Humboldt as a comparative enumeration of the venomous species in the old world, and in America.

In the old continent.

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<th>Species</th>
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<td>Bungari</td>
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In the new continent.

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<td>Hydrophis</td>
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See the Recueil d'Observations de Zoologie et d'Anatomie comparée, v. 2. p. 5.

**Horny Covering of the Jaws in the Chelonian Order.**—This subfamily is similar in its nature to that which compiles the hollow horns of animals (see Horn); and there is no essential difference between it and that of the bill in birds. (See Birds, in Comparative Anatomy.) As in birds, this horny covering is spread over the opposed surfaces of the two mandibles; but the organ so covered is much less susceptible of motion in the tethuidines, as the upper mandible is always fixed in them. In general it is feebly fibrous in its texture, but sometimes it appears homogeneous. It is very hard, so as to enable these animals to break shells with facility. In this respect, it is analogous to the horny bills of the birds of prey, and the resemblance is so striking in one species of turtle, that it has received the name of hawk's-bill. It is formed on a similar substance covering the bone, as is the case with the hollow horns and the bill of birds. The edges are sometimes simple, sometimes serrated, sometimes divided into large unequal teeth; the extremity is either entire and rounded, or grooved, or brought to a sharp point. The edge of the upper jaw is terminated by a thin sharp plate of horn, within which the lower palatine is some height, being rather narrower in its transverse measurement; hence any subfamily may be cut by them as with felisars, for the outer margin of the lower jaw is also brought to a sharp edge. Besides this sharp edge, there is a covering of some breadth in the upper jaw, forming a ridge.
a ridge towards the anterior part, received into a corresponding concavity of the lower jaw.

Sulciary Glands.—We have already observed, that nothing deferring the name of modification takes place in any reptile. They live on other animals, and almost universally swallow them whole. Some teudines feed on shell-fish, and laugh the telencephalic coverings with their bony mandibles, but they do not chew the contained animals. The salivary apparatus multi, therefore, be very different from that of the mammals.

Several reptiles, however, require the afflatus of fluids poured into the mouth for feizing and swallowing their prey. Some, as the frog and camelion, dart out the tongue, covered with a viscid matter, upon insects, which are captured in the slime, and thus captured. Serpents spread a frothy flaver over the animals which they swallow, to facilitate their passage.

In some reptiles the tongue is composed, in great part, of a thick glandular mass, formed of numerous small tubes united at their bises, and separating towards the surface of the tongue. There are so many papillae, giving a brilly appearance to the organ, or rendering it villous, when they are very small. The sides of the mass are perforated by numerous pores, through which the secreted fluid escapes. This gland rests on the muscles of the tongue, and follows the motions, which they communicate to the organ. The gland in question exists in the chelonia; in the teududo greca the structure just described is very evident. It exists also in several faurians, as the flat-headed gekko (G. fimbriatus), the common iguana, and the Schneiderian fckink. In the agame umbra (iguana umbra, Linn.) the gland is surmounted in front, instead of papilla, with transverse plates closely arranged. These lamina close the whole surface in the camelion.

The tongue seems to be covered by an anogalous glandular subflaice in the faurians. Where the tongue is scaly, or smooth, and covered with a simple membrane, the place of this gland is supplied by two others, elongated and glandular, situated under the skin, along the external surface of the branches of the lower jaw-bone, and pouring out their fluid at the outside of the teeth of the same jaw. In this direction they are in contact with the palatine membrane. These glands are strongly marked in the tupinambes, the colubres, and the boa. In the amphibia the glands are not situated in the same place, although they have the same apparent structure. They lie immediately under the tongue, between the genio-glodi and genio-hyoidi.

The conglomerate gland secreting the poozorous fluid of the venemous serpents is spoken of in the description of the teeth. The os hyoides varies in the different orders of reptiles, but it approximates in general very nearly to that of birds, from which it does not differ essentially in the faurian and ophidian orders. As in birds, its connections with the larynx are very inconsiderable: there is no muscle passing between them: a simple membrane is the medium of union. They are, in fact, completely separated in some genera of faurians; as, for example, the camelion: and the same observation may be extended to all the ophidiains which have a tongue included in a sheath. This circumstance completes the proof of what is rendered very probable by many other reasons, that the essential function of the os hyoides is to support the tongue, and afflit its motions.

The form of the os hyoides varies much in the chelonia: sometimes the body is nearly square, thin, and flattened, then the posterior cornua are straight, articulated to the posterior angles of the body, separating from each other as they pass backwards, and having the larynx placed in their interval. The anterior cornua are consolidated to the body, a little behind the anterior angles, directed backwards, and curved upwards behind the occiput. In front the body is prolonged into a point, under the tongue, which it supports. Such an os hyoides is seen in the teududo greca. But in the matamata (teududo fimbriata, Gmel.) the body is very solid, bony, and pyramidical, with the bases turned forwards. The anterior cornua, forming angles towards the front, are articulated behind each angle terminating the basis; while the posterior, more slender, and bent like an arc, are fixed near each other to the apex of the pyramid.

Usualy the os hyoides consists merely of cartilage in the faurians, as in mott other reptiles; its parts are generally slender, elongated, and consolidated with each other. Yet it prefers in the crocodile that flattened shield-like figure, which we have described it to possess in the chelonian order, and which we shall discover also in the batracians. There are only two cornua, articulated nearly in the middle of the sides of the cartilaginous plate. They seem formed of two portions united together, but distinguished by a kind of angle projecting posteriorly.

In the common iguana (I. delicatissima, lacerta iguana, Linn.) the body may be considered merely as the point of union of the seven cornua composing the os hyoides. An anterior one is continued under the tongue, without being fixed to it. The fix others are beneath. The two lowest are the longest; they are contiguous, slightly curved, and enter the goitre, without affording attachment to any muscular ligaments. The four others are true cornua of the hyoid cartilage. Two pass first forwards, but quickly bend backwards, and then upwards, to reach the occiput. The others are bent backwards and upwards, so as to remain nearly parallel to these. They are analogous, in their form and use, to the corresponding parts in birds. The cornua belonging to the goitre are found also in the lizards, agames, and dragons. In the dragon raye (draco lineatus) their extremity is attached to the large bag forming the goitre, and will draw it inwards, when the tongue passes out of the mouth. These cornua are not found in the other faurians. Sometimes there are only two hyoidal cornua, as in the gecko fimbriatus. They are always perfectly analogous to those of birds.

The os hyoides of the camelion has four; of which two are straight and directed obliquely forwards. The two posterior go behind the head. The body is prolonged to nearly the anterior third of the tongue, when that organ is in the state of repose: it is cyndrical and flender in the whole of this part, which is between one and two inches long.

In the lizards and tupinambes, the number of cornua is also four. The anterior are formed of two pieces, consolidated, or moven on each other, of which the first is directed forwards, while the second turns backwards, and is curved towards the occiput.

In the ophidiains, with a tongue incloded in a sheath, the hyoid cartilage is composed of two parallel threads, directed from before backwards, approximated to each other, separated in their anterior half by the sheath of the tongue, and in the rest of their extent by the two hyoglophi. The two threads are united in front, nearly between the posterior extremities of the branches of the jaw, being bent into a semicircle under the sheath of the tongue; from the convexity of their union a short point is continued under the sheath. In the other ophidiains, as the amphibia, &c., the
the hyoideal cartilage has a triangular figure; the two posterior angles are elongated to form the cornua.

The os hyoideum forms a broad nearly square plate, immediately applied to the inferior parietes of the palate and back of the mouth, in all the batracians, except the falkamanders. The anterior cornua go off towards the front from the anterior angles, separate more widely before they turn backwards, then are continued towards the angle of the jaw, and curved from below upwards, in front of this angle, to be fixed to the posterior part of the cranium. The posterior horns are straight, strong, bony, not conflated with the square plate, but articulated to its posterior angles, and directed obliquely backwards and downwards. The larynx is placed between the horns. The hyoid cartilage of the falkamanders has a triangular form; the cornua go off from the posterior angles, and ascend at the sides of the neck. Their posterior edge is conflated to a thread of the name nature, bent in the form of a handle, and having its anterior extremity united to that of the opposite thread in the middle of the posterior concavity of the hyoid cartilage. On each side of the branches of this cartilage, towards the front, there is a broad cartilaginous plate, nearly parallel to them, and only joined by muscles which go from one to the other. It seems to hold the place of an anterior horn.

In the thirty-fourth plate of the fifth volume of the Lecons d'Anat. comparée, there are figures of the os hyoideum of the iguana, the Nilotic crocodile, the Nilotic tupinambis, the laertia agilis, the gecko simbranis, anphibiana, another serpent, the teludo graca, the falkamander and frog.

Muscles of the Os Hyoideus.—In the falkamanders, which have a more or less protractile tongue, these muscles contribute greatly to its elongation, by carrying the bone forwards.

We find in reptiles, t.s., a muscle analogous to the mylo- hyoideus. It is composed, in the two first orders, of several portions; viz., an intermaxillary, fixed to the lower edge and internal surface of the branches of the lower jaw; a second very thick, ascending behind each angle of the jaw, upon the digastricus, and attached to the occiput; a third passing to different distances in the neck, fixed to the skin above, and embracing the neck like a girth. It is analogous to the cutaneus coli; and embraces the whole extent of the neck in the chelonians. In the common iguana the intermaxillary portion does not extend to the arch of the chin; and in the gecko there is only a thin aponeurosis reaching so far. But, in general, the mylo-hyoides is fixed to the os hyoideum in these two orders, which is not the case in the batracians; in which the muscle seems to exist merely for the purpose of filling the wide interval between the maxillary branches, and supporting and elevating the parts above it. Its fibres are directed transversely from one branch to the other; they are divided in several species by a median line, and attached to the internal surface of the maxillary branches, which enables them to elevate more advantageously the subjacent parts. In the rana ocellata the posterior edge is separated on each side, to ascend within the angle of the lower jaw as high as the palatine membrane.

2. The muscle analogous to the falkro-hyoides is attached in the chelonians, between the two cornua of the same side, and to the posterior cornu; it descends along the neck, passes within the first bone of the shoulder, and is inserted on the inside of the neck of the second bone. It reds, in this course, against the fides of the oesophagus, and is strongly attached to the pharynx towards its anterior extremity.

The same muscle, in the falkamanders, is attached on the outside of the sternum, between the falkro-mastoideus, and is fixed to the posterior cornu of the hyoid cartilage. In the iguana, it is fixed to nearly the whole posterior edge of the first part of these cornua; in the gekko simbranis, to the middle of this edge. In the falkamander, after touching the os hyoideum, it is continued to the lower jaw, and inserted far back in its lower edge.

It is much elongated in the falkamander, and carried far backwards on the outside of the sternum, forming a point in the same direction. This muscle covers another, thinner and broader, but of the same length, equally contiguous to its fellow of the opposite side in the two posterior thirds, and inserted in the extremity of the posterior cornua of the os hyoideum. It might be named falkro-ceratoideus. In the agama umbra (iguana umbra, Linn.), the same muscle extends equally backwards on the outside of the sternum. The falkro-hyoides has two portions in the crocodiles, which are only separated beyond the sternum: the lower one is thinner, and inserted in the edge of the hyoid plate; the outer, broader and thicker, reaches the posterior edge of the cornu, and after a slight tendinous interfection, which serves to attach it to this cornu, is continued in the same direction to the jaw, and forms the first layer of the cerato-maxillary muscle.

In the serpents, the place of the falkro-hyoides is supplied by a collo-maxillary muscle, extending from the anterior ribs to the lower jaw. Its internal fibres go from the jaw and the ribs to the hyoid cartilage.

It is prolonged, in the batracians, except the falkamanders, within the sternum, to the farthest end of this bone, where it is fixed; or it only reaches the middle of the sternum. Many of its fibres are expanded on the pleura. In front it is divided into several portions, inserted successively in the external edge of the hyoid plate. One of these goes as far as the anterior cornua, and is fixed to it by a slender tendon. In the falkamanders, the falkro-hyoides is continuous with the rectus abdominis, and participates in its motions.

3. The omohyoides does not exist in the batracians.

In the chelonians it ends in the sheath of the mylo-hyoides, which includes the extremities of the anterior cornua of the os hyoideum. This muscle is very considerable in some falkamanders. In the gekko, for example, it is widened, to be inserted in the greatest part of the posterior cornua; it covers the greatest part of the falkro-hyoides in front.

In the iguana it is contiguous to a muscle, which has the same direction; it is attached to the clavicle behind, and above the body of the hyoid cartilage in front. In the falkamander it is also composed of two portions. The external, which is soon detached from the following, is fixed to the palatine membrane near the lower jaw. The internal is attached to the angle of the hyoid cartilage.

It is long and slender in the falkamander; it passes on the outside of the sternum, to the falkro-ceratoideus, and is fixed to the body of the os hyoideum, on the outside of the falkro-hyoides.

The omohyoides of the frog is mentioned in the account of the muscles of the shoulder.

4. Muscle analogous to the mylo-hyoides. This has only been noticed in the frogs and toads. It comes from the back of the head, behind the ear, where it is attached at the side of a muscle analogous to the falkro-mastoideus. It is divided into two portions in the rana ocellata, and into three in the common frog; they are all attached to the posterior cornua.

5. The genio-hyoides. The chelonians have only one, the tendon of which is fixed to the arch of the chin; the two feathery portions separate as they go backwards, and are fixed to the basis of the posterior hyoideal cornua. In several falkamanders the structure is nearly the same; as in the common iguana, and the falkamander, for example. It consists of two portions
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portions in the camelon; an internal long and slender one, inferted in the body of the os hyoides; an external broader and stronger, contiguous to the former, and attached to the posterior cornua in their whole length; it has an attachment also to the anterior cornua.

In the ophidians the genio-hyoidei are continuous behind with the collo-hyoidei. They are only observed in those whose tongue is not inclosed in a sheath.

The genio-hyoidei are divided behind into two portions, in the batracians. The external and short is inferted on the side of the hyoideal plate above its edge; it is prolonged on the posterior cornua, and furnishes a sheath to the hyoglossus. The ferno-hyoideus penetrates between these two portions, to be fixed to the plate.

6. The cerato-maxillary muscles. These are analogous in their attachments and use to the conical muscles of the os hyoides in birds: they only differ from them in not being turned round the corona. They are found in the three first orders, but do not exist in the batracians. They arise from the posterior third of the internal surface of the branch of the lower jaw, and proceed backwards and inwards to the posterior cornua of the os hyoides. There are two on each side, attached to the four cornua, in the iguana. This animal hires, moreover, a transverse muscle of the cornua, the fibres of which go obliquely outwards from the anterior to the posterior cornua of the same side.

In the agama umbra the lift muscle is long and slender, continued from the extremity of the posterior cornua to the angle of the anterior.

In the chelonians, the cerato-maxillary are inserted into the extremities of the anterior cornua.

The tongue varies considerably in this class of animals; it is employed, in many influences, as the means of procuring their food, by those reptiles which feed on insects. But as none of this class maliciously their aliment, or swallow it like the mammals, the form of the organ is very different from that which it exhibits in the mammiforous animals.

The chelonians have a small pyramidal tongue, with the base turned backwards, the apex forwards.

A large part of the faurians and ophidians have a tongue capable of considerable elongation. The most remarkable example occurs in the camelon, where it is not larger than a quill, but five or six inches long: it is expanded at its extremity, which is covered with a viscus secretion. This weapon lies commonly in a sheath at the bottom of the mouth, contracted to the length of about an inch, or less. The animal can dart it out at pleasure, when the viscus fluid at its end entangles the prey, which is taken into the mouth with great celerity. "Quand les caméléons veulent manger," says Belon, "ils tirent leur langue, quasi d’un demipied, ronde comme la langue d’un oiseau nommé pic-vérd, semblable a un verre de terre; et a l’extremité d’icelle ont un gros noeu moufigeux, tenant comme glu, duquel ils attache-t les infeçtes, favors est faurettes, chenilles & mouche, et les attirent en la gueule. Ils poufettent hors leur langue, la dardant de roideur auffi viment qu’un arbalète ou un arc fait le triail." Pierre Belon, Observations, &c. liv. ii. ch. 34.

In the common lizards, the tupinambes, &c. the tongue is smooth, extensible, and terminated by two long flexible points, although semi-cartilaginous and nearly horny; it resembles perfectly that of the ophidians, excepting the anguis and amphibians, and perhaps also the cecilia, which have it flat, and merely forked at the end, without the power of elongating it.

In most of the serpents, the tongue, when contracted, is contained almost entirely in a membranous sheath. The mechanism belonging to these projectile tongues partakes of that of eared animals, as the echidna and the ant-eaters, and of that of birds. (See Mammalia and Birds, in Comparative Anatomy.) It depends on muscles acting on the os hyoides, and also on the muscles of the tongue.

The iguanas and iguanas have a fleshy tongue, villous on its surface, and possessing the same mobility as that of the mamalls. In the feins and geckos it differs from the former only in being suffused at the end; and it resembles, in this respect, that of the aneges, between which and the feins there is in all points much analogy.

The tongue of the batracians is not only different from that of other reptiles, but also from that of other animals. It is fleshy, of a flattened figure, smooth, and covered, in all of the frog and toad kind, with a tenacious mucus. It is villous in the falamanders, and covered with very long papistle in the horns frog (Bufo cornutus, rana cornuta, Linn.). The great peculiarity of the tongue is its being attached by the basis to the front of the mouth, to the surlylises of the lower jaw. This is its thickest part: it is continued backwards in a thinner form, so as to end in two loofe and flat portions, representing the apex, and lying in the back of the mouth. This loofe part, ordinarily turned back towards the throat, is projected from the mouth, covered by its viscous secretion, upon the small infected which the animal feeds on, and which are thus entangled and swallowed.

Mucules of the Tongue.—They possess nothing peculiar in the chelonian reptiles, which have not an extendible tongue: they consist merely of two pairs. The hyoglossi come from the anterior half of the posterior cornua, and penetrate into the tongue at the sides of the basis.

The genio-glossi are very strong and broad in the vertical direction: they come from the front of the lower jaw, and enter the tongue more outwards and forwards than the preceding, with which their fibres are interwoven. The apex of the hyoid cartilage penetrates between them: they are also separated by a small cylindrical cartilage, to which each muscle is fixed; which is prolonged behind under the body of the hyoid cartilage, extending in front to the apex of the tongue.

The faurians have in general three pairs of mucules going to the tongue from the os hyoides or the arch of the chin, and a proper muscle attached to the organ only.

1. The hyoglossus comes from the cornua of the hyoid cartilage. In the common iguana it is attached to the posterior cornua, opposite the omohyoideus. In the gecko limbratus it is fixed to the middle of the cornua, at the side and within the cerato-maxillaris: it forms, with the straight genio-glossus, the basis of the tongue, and mixes its fibres with those of the proper muscle. The hyoglossus is long and cylindrical in the lizards and tupinambis: it comes from the extremity of the posterior cornua, approaches the opposite muscle as it advances forwards, becomes contiguous to it at the basis of the organ, towards the extremity of which it terminates in forming the two portions of cylinders, of which this tongue consists. In the camelon it is fixed to the whole anterior edge of the posterior cornua, and is very thick at that part. Beyond the angle formed by the two cornua of the same side, it is curved and continued directly forwards. The Fasciculi of fibres, of which it consists, are infected in the posterior half of the sheath of the tongue, which it serves to draw backwards.

2. The straight genio-glossi come from the inferior edge of the arch of the chin, and are continued to the basis of the...
of the tongue; where they meet the hypoglossi, with which their fibres are interwoven.

3. The transverse genio-glossi are attached to the arch of the chin, and to the anterior part of the inferior maxillary branches, on the outside of the preceding. Instead of being narrow and elongated, they are broad and short. Their fibres pass obliquely from without, inwards and backwards upon the membrane of the mouth, as far as the sides of the tongue; which they will draw outwards and forwards. The two left pairs of muscles do not exit in the camelion.

4. The proper muscle is found in those saurians only, whose tongue admits of elongation. It is composed, in general, of annular fibres. In the gecko fimbratus, which has a broad tongue, this muscle is divided in front into fix or eight small portions, which are united into two towards the middle third of the tongue, and then into one on each side, which form the two pieces of the basis of the tongue.

In the camelion the annular muscle is very thick, and forms a flasky cylinder surrounding the anterior three-fourths of that part of the os hyoides which penetrates into the tongue. Towards the front it is divided on the sides into two portions, a superior and an inferior; the latter is folded back towards the sheath of the tongue, to which it adheres. There is, moreover, a muscle proper to this sheath, which may be called the retractor muscle. It comes from below the glandular part, and is continued, on each side, as far as the part that is puckered up. When the hypoglossus throws this latter part into wrinkles, and shortens it, and the os hyoides is carried backwards by the flerno-hyoides and ceratoidei, the retractor muscle causes the end of this sheath to remain applied to the extremity of the annular muscle which recedes, because then its posterior attachments are more fixed; on the contrary, when the extremity of the os hyoides and the annular muscle push the sheath forwards, the anterior attachments have a point d'appui; the posterior portions of the retractor draw forwards the sheath, and unfold it.

By putting together what we have said concerning the os hyoides and its muscles in the camelion, in a former part of this article, and what we have just said of the muscles of its tongue, it will be easy to understand how this organ can be elongated, and withdrawn into the mouth. The first office is performed by the annular muscle, with the cerato-maxillary, and the genio-hyoid. The flerno-ceratoidei and hyoides carry backwards the os hyoides, at the same time that the hypoglossus shortens the sheath and puckers it up.

In most of the ophidian the tongue is included in a membranous sheath, which opens behind the interval of the branches of the lower jaw, and is continued backwards between those of the hyoid cartilage, under the trachea. It is lined internally by the membrane of the mouth. This sheath is carried forwards by a pair of muscles analogous to the genio-glossi. They derive their origin by two portions, one of which comes from between the two branches of the lower jaw, the other from their extremity; they come together and are fixed to the sides of the sheath to its most distant extremity. The hypoglossi are two elongated muscles, contiguous, and even united together by fine cellular filaments. They exactly fill the interval of the cornua of the hyoid cartilage, and are even doubled backwards round their extremity. These muscles go to the basis of the sheath, and draw it backwards, when it has been carried forwards by the two first pairs.

The proper muscle is formed of two cylinders, first lying together, and separated towards the anterior third of the tongue, for the two portions of which its apex conflits; here they become considerably diminished, and are reduced to a mere thread at the end.

This simple apparatus, combined with that of the os hyoides and its muscles, gives to the tongue of the serpent that wonderfully quick power of extension and retraction. Carried forwards by the genio-vaginal muscles, brandished by its proper muscles, it re-enters the sheath in consequence of the elasticity of the hyoid plate, which tend to restore themselves, and of the action of the hypoglossi. One or other of these actions is assisted by the collo-maxillary muscles, according as the portion analogous to the flerno-hyoides, or that which corresponds to the cerato-maxillary, contracts. The extension of the tongue out of the mouth is so much the greater, because it is effected through an orifice near the extremity of the flou, and because its bays may be brought near to this part.

In the amphibians, which have a flattened tongue, not included in a sheath, nor susceptible of extensive motion, there are, first, two genio-glossi attached to the arch of the lower jaw, more internally than the genio-hyoides; zedly, two hypoglossi; and zedly, two cerato-glossi, which present nothing worthy of particular notice.

The tongue of the batracians, as we have already described, is fixed in front to the arch of the lower jaw, and free behind. In passing out of the mouth, and going back again, it turns upon the fixed point of its attachment to the jaw. Two pairs of muscles, the genio-glossi, and the hypoglossi, execute these motions. 1. The hypoglossi form, in the rana ocellata, two cylindrical masses, lying on, and attached to, the posterior cornua. They soon unite into a single mass, which refles on the hyoideal plate, and penetrates the tongue in front of this plate, expanding into small fuzzy, which reach to the lower edge of the organ. 2. The genio-glossi form at first two small cylindrical masses, placed at the arch of the chin on the small transverse muscle; they are subseqently elongated into two contiguous cylinders, of which the fibrous fasculii separate from each other, divide and thole of the preceding muscle, and go to the lower edge of the tongue. While the tongue is in the mouth, the hypoglossus is folded on itself, and the genio-glossus is straight. The latter muscle is folded, and the former straight, when the tongue has been projected. In the common frog, these two pairs of muscles are not so minutely divided in the tongue, and the genio-glossi do not form cylindrical masses towards the arch of the chin, in other respects they are similar.

Tongue of the Crocodile.—Humboldt has observed a peculiar mechanism in the tongue of this animal, bearing an evident relation to its wants and habits, of which the following is a description in his own words.

"From the most ancient times disputes have existed concerning the tongue of the crocodile; some naturalists pretended that it was entirely wanting, others affirmed that it was very short, and placed at the entrance of the ophagus. According as one or the other of these opinions prevailed, the sculptors and antiquaries of Rome amused themselves with destroying or restoring the tongues of their crocodiles. When we examine attentively the os hyoides of this animal, we find that it is in consequence of its form and small size that a part of rather a fold of the tongue has been confounded with the whole organ. There it is in this animal a peculiar mechanism, by which a valve is formed, interrupting the communication between the mouth and throat. When the crocodile appears motionless on the bank of the river, with the jaws opened at an angle of
95. the whole mouth appears yellow: the valve is elevated, and the opening of the fauces is not seen. If we surprise him, the valve is generally depressed; and if a person runs the risk of approaching sufficiently a round body of a beautiful red colour, which is the opening of the glottis, may be perceived. This valve enables the crocodile to seize his prey under water without running the risk of being inundated by the great quantity of fluid that would pass into the oesophagus. When he swallows, the valve must be depressed, and the animal on dry ground. The os hyoides of the crocodile of the Orinoco is a membranous spatula, broad, concave, and terminated by two short horns. The os hyoides of the Egyptian crocodile, as delineated by Mr. Duverney, is altogether different from that of the South American animal; another proof of the distinction between the crocodiles of the old and new continent. In an animal of eighteen feet, the tongue is twenty-five inches; it is yellow, fleshy, and covers the whole jaw; but it is attached on all sides, so that the os hyoides cannot elevate it to the end. The anterior or spatula-shaped portion of this bone enters the membranous substance of the tongue; which can elevate it at a right angle. As the fides and extremity of the organ are fixed, this motion of the bone can only carry with it the membranous part of the tongue, which forms the fold presenting itself like an elevated valve. The os hyoides is depressed, and the valve immediately disappears. Three conditions are necessary to the execution of this mechanism, a tongue attached to the lower jaw; a ductile and flexible membrane covering it; and an os hyoides broad in front. The yellow substance in the anterior part of the mouth belongs to the tongue as well as the fold covering the entrance of the oesophagus. Humboldt has found that the tongue swelled very much, when subjected to Galvanic influence, by means of zinc and silver. See Recueil d'Observations d'Anatomie comparée et Zologie, faites dans le Voyage de Humboldt et Bonpland, t. 1. pag. 9. pl. 4.

Geoffroy gives a similar description of the tongue, os hyoides, and their mechanism, in the Nilotic crocodile. He describes it as a yellowish, flaggroomed skin, exactly like the substance of the palate, placed by numerous small holes, the excretory ducts of the glands situated on its upper surface, and adhering on all sides to the branches of the lower jaw. He speaks of the broad anterior part of the os hyoides forming, by its elevation, a veil, which covers all the back of the mouth. Thus, the animal can remain under water with the jaws open, and receive air through the nares, the only part above the surface, without the water entering the throat or trachea. Annales du Muscum, vol. ii. p. 42, et seq.

Epiglottis.—In most reptiles the opening of the glottis is neither covered by a valve, as in the mammalia, nor armed with papilae, as in birds. Yet a kind of epiglottis may be observed in the common iguana, and in the Schneiderian skink. There is a rudiment in the crocodiles; it does not appear in several other animals of the same order, nor in the chelonian, ophidian, and batrachian reptiles. The cylindrical larynx of the dragon, and its simple opening beneath the root of the tongue, are very well represented in Blumenbach's Abbildungen Natur-Historischer Gegenstände, No. 98. Is the absence of the epiglottis connected with the peculiar modification which respiration undergoes in this clafs? or with their deglutition? On the former point we may observe, that, as they breathe only at considerable intervals, there is no danger of the glottis being opened during swallowing, and its edges may consequently be kept closely approximated. Again, as they swallow their food whole, it is not likely to pass into the larynx.

Fauces.—The openings of the nares are situated very forwards in reptiles, and are not closed by any moveable curtain, as in the mammalia. A kind of immovable valve, attached to the anterior edge of the opening, and leaving the orifice free behind, may be seen in the gecko fimbratus.

There is something analogous to the velum palati in the crocodile. The nares open far back, contrary to what we have mentioned concerning other reptiles. They form a round aperture in the most distant part of the arch of the palate. The membrane lining this concavity forms a loose production a little in front of the opening in question, which descends on the sides, forming a little broader, until it meets another elevation behind the basis of the tongue. These form together, by their loose edge, the iliums faucium, or entrance of the throat. The first affords some protection to the opening of the nares, but cannot entirely close it; the latter contributes, with the rudiment of the epiglottis already mentioned, to cover the glottis.

The entrance of the throat is large in all reptiles, and capable, in many, of still greater size, by the expansion of the lower jaws. There is nothing deferving the name of ilium. They swallow entire animals, which cannot pass into the nares, and hence do not require a velum palati.

Pharynx.—As the nares open forwards in reptiles, the pharynx has not the same relation to the nasal cavity, as in the mammalia and birds. The mouth and larynx communicate with it, and there is usually a large aperture corresponding to the Eulachian tube.

The pharynx can hardly be distinguished from the commencement of the oesophagus in reptiles. Their diameter is usually the same; and there is absolutely no difference in the aspect of the membrane forming their internal parietes. It presents a great number of longitudinal folds, which are effaced when a prey of large size is swallowed. There is no external mufcle enveloping the entrance of the canal.

Deglutition may be affiicted, in the chelonians, by the action of the terno-thyroidei, which rest on the oesophagus in the whole length of the neck; and even adhere in front to its parietes, and to the part which may be regarded as belonging to the pharynx. The os hyoides may also contribute to deglutition, by means of the muscles which elevate it.

This office is particularly evident in the batrachians, and especially in the frogs and toads. The hyoideal plate, which supports in these animals the extensive parietes of the back of the mouth and palate, is put in motion by the mylohyoideus and the muscles analogous to the tylo-hyoidei, only for the purpose of elevating these parietes, and applying them to the concavity of the palate. There is also another muscle coming from the upper and back part of the head, in front of that which corresponds to the tylo-hyoidei; it is narrow at its origin, but expands as it passes forwards and downwards, and as it covers that part of the throat which is prominent behind. It is continued to the edge of the hyoideal plate, in which it is inflected, its fibres adhering also to the membrane of the throat, in which they lie. Their action will elevate the hyoideal plate, and apply the membrane which they cover to the opposite surface of the cavity.

The longitudinal fibres, belonging both to the pharynx and oesophagus, are more or less strongly marked.

Oesophagus and Stomach.—The former tube does not present thoé dilatations which we notice in birds: it retains nearly an uniform diameter throughout, or the change, if any, is gradual. But this diameter is, in most cases, much more considerable, in comparison with that of the stomach, than in the two preceding clasles. Under certain circumstances, indeed, the oesophagus is larger than the stomach.
in the ophidians; for example, when the latter is not dit-
tended with food, became its paries contract sooner after
enlargement than those of the oesophagus. The membranes
are the none in both, and, when the tube Increases in size
infamibly to the stomach, it is often very difficult to affin
the limits of the two parts, and consequently the situation
of the cardia. The stomach is generally without any cul-
de-fac, oval and elongated: its paries usually thin. The
mucous coat is then hardly perceptible, at least in some
part of its extent, and the cellular is confounded with the
muscular or internal. The pylorus is usually without any
valve; it is marked by a simple contraction, by the greater
thickness of the paries of the stomach, and by the different
structure of the intestinal membranes.

In the turtle, the internal surface of the oesophagus is
beef with long, hard, conical papillae, of which the points
are directed backwards, with the effect, apparently, of pre-
venting the return towards the mouth of the matters swal-
lowed by the animal. Such, at least, is the notion generally
entertained of the end of purpose of this structure. But the
abence of such provision in all other animals, where the ne-
cessity seems equally to exist, cannot but render us sceptical
on the subject, more particularly as we know no facts con-
cerning the nature of the food, the mode of its deglutition,
nor any peculiar modification of surrounding or connected
organs, to which this singular structure might be supposed
to bear some relation. The stomach is gradually dimin-
ished in size from the cardia to the pylorus: it is bent on
itself, and the portion beyond the curvature is thicker than
the rest, in consequence of the mucous fibres being more
copious. The internal coat has longitudinal folds in this
part, but hardly any in the other. The situation of the
cardia is well marked, and the oesophagus is distinguished
from the stomach by the sudden dilatation of the latter.
The pylorus has no valve.

Among the furredians, the crocodile has a peculiarly shaped
stomach; it is very distinct from the oesophagus by its glo-
bular figure. Near the insertion of this canal there is es-
parated from it below a small cul-de-fac, opening into the
testicle by a very small orifice, and having its cavity sepa-
rated from the great sac of the stomach by a kind of brant.
Consequently the general cavity of the stomach is a large cul-
de-fac, of which the paries are very thick. The internal
membrane forms considerable plaitings arranged in a serpentine
form, like the convolutions of the brain. The cellular coat,
which is not very distinct from the mucous in the oesophagus,
becomes more so in the stomach. The mucous nearly
equals the two others in thickness; the coats are altogether
much thinner in the small cul-de-fac.

In the other furredians there is no cul-de-fac. The stomach
is oval and very elongated in the iguana, without curvature;
the oesophagus dilates gradually to form it. The only mark
that can guide us in determining the situation of the cardia is,
the cleft of the longitudinal folds of the internal oeso-
phageal membrane. The stomach is suddenly contracted,
and bent a little before its termination at the pylorus. Its
paries become thick and opaque at some lines from this
aperture, from an increase of the mucous fibres, of which the
transverse are strongly marked. The internal coat forms
no fold; there is no valve at the pylorus, which is very
small.

In the tupinambis monitor the stomach forms a long tube,
left into almost a complete circle.

In the Schneiderian lacm we again meet with the fame
elaganted form, transparent paries, and difficulty of distin-
guishing the stomach from the oesophagus, except by the
longitudinal fold: of its inner membrane, and the thickness
of its muscular coat. But the posterior part of the stomach
contracts suddenly, is bent towards the right, and a little
elaganted in this direction before it terminates. The par-
ies of the latter portion are more thick and opaque, and
its internal membrane is folded longitudinally.

The stomach begins by a small dilatation in the camelion,
then it assumes a cylindrical and elongated form, and is bent
on itself; it is considerably contracted before it terminates,
and forms a small cylindrical canal, of which the internal
membrane is folded longitudinally. The muscular coat is
thicker in this contracted part than elsewhere. It forms a
prominent ring at the pylorus.

In the dragon the stomach is shaped like a pear, of which
the large end corresponds to the cardia; it has no curvature;
it's paries are transparent; they become thicker and opaque
near the pylorus; and these characters are the only circum-
stance, by which we can distinguish it from the beginning of
the intestinal canal, which has thin and transparent coats.

The stomach is also pear-shaped in the gekko; the oeso-
phagus makes a curve before it ends, and is inflected at one
side of the base. It is narrow, with thick coats, a strong
muscular covering, and broad longitudinal folds of the in-
ternal or mucous coat. The sides of the organ are thicker
at its extremities; and the pyloric end is a little bent. The
internal membrane is smooth.

In the ophidian order the stomach is shaped like an in-
testine, hardly larger than the oesophagus, and without cur-
vature. The internal membrane is folded longitudinally.
When the stomach is empty, these folds are thicker than
those of the oesophagus, which are not always observed.

The oesophagus of a snake, examined by Spallanzani,
formed a cylindrical tube like an intestine, for about nine
inches: it then became gradually narrower, so as to con-
stitute a funnel of the length of four inches and a half. This
funnel was the true stomach. The sides of the stomach
were thicker than those of the oesophagus: no glands or
follicles could be seen in the latter; but the stomach was
abundantly supplied with them throughout its whole length;
they discharge part of their liquor on being pressed, and the
internal coat is moistened with it. Differtations relative to
the Natural History of Animals and Vegetables, v. i.
p. 112 and 113.

In frogs and toads the stomach is shaped nearly as in the
chelonia reptiles. At first considerably dilated in compari-
son with the oesophagus, it is gradually contracted, then
curved so as to form an intestine-like canal, with thick coats,
ending at the pylorus.

It is slightly curved only near its posterior extremity in the
familiari. Its figure is elongated and not much swoln; the paries thick; and the internal membrane ex-
hibits small rugae. There is a fold near the pylorus, in the
situation of the curvature. Figures of the stomach and intestines of various reptiles are given in Cuvier’s Legons,
pl. 41.

Intestinal Canal.—Its length, in proportion to that of the
body, is greatest in the mammalia, and diminishes successively
in birds, reptiles, and fishes. In reptiles it is often hardly
twice the length of the body, taken from the extremity of the
front to the anus. But tadpoles exhibit in this respect a
remarkable peculiarity. Their intestinal canal is nearly
ten times as long as the space between the snout and anus,
while in the frog it is not more than twice the length of the
corresponding space. Other important differences, which
will be noticed subsequently, exist in the two sexes. This
shortness of the alimentary canal corresponds to the nature
of the food in reptiles, which is derived from the animal
kingdom.

The
**REPTILES.**

The following table of the length of the intestinal canal in various reptiles, is taken from the third volume of Cuvier's *Leçons d'Anatomie comparée*, p. 457.

<table>
<thead>
<tr>
<th>Names</th>
<th>Length of the body</th>
<th>Length of the small intestine</th>
<th>Length of the large intestine</th>
<th>Length of the whole canal</th>
<th>Proportion to the length of the body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testudo greca</td>
<td>0.210</td>
<td>0.680</td>
<td>0.014</td>
<td>0.694</td>
<td>:: 1 : 3.3</td>
</tr>
<tr>
<td>Nilotic crocodile (adult)</td>
<td>1.690</td>
<td>5.384</td>
<td>0.406</td>
<td>5.790</td>
<td>:: 1 : 3.4</td>
</tr>
<tr>
<td>Nilotic crocodile (young)</td>
<td>0.240</td>
<td>0.710</td>
<td>0.036</td>
<td>0.986</td>
<td>:: 1 : 4.1</td>
</tr>
<tr>
<td>Gymnophiona (gavial)</td>
<td>0.150</td>
<td>0.180</td>
<td>0.010</td>
<td>0.200</td>
<td>:: 1 : 1.3</td>
</tr>
<tr>
<td>Gecko à goutelettes (gecko guttatus)</td>
<td>0.125</td>
<td>0.120</td>
<td>0.035</td>
<td>0.155</td>
<td>:: 1 : 1.2</td>
</tr>
<tr>
<td>Schneiderian coccin</td>
<td>0.150</td>
<td>0.230</td>
<td>0.171</td>
<td>0.401</td>
<td>:: 1 : 2.8</td>
</tr>
<tr>
<td>Iguana arboisi (iguana carules)</td>
<td>0.180</td>
<td>0.175</td>
<td>0.026</td>
<td>0.237</td>
<td>:: 1 : 1.3</td>
</tr>
<tr>
<td>Common iguana</td>
<td>0.220</td>
<td>0.400</td>
<td>0.230</td>
<td>0.630</td>
<td>:: 1 : 2.9</td>
</tr>
<tr>
<td>Lacerta agilis</td>
<td>0.088</td>
<td>0.050</td>
<td>0.017</td>
<td>0.067</td>
<td>:: 1 : 3.9</td>
</tr>
<tr>
<td>Common snake (coluber natrix)*</td>
<td>0.500</td>
<td>0.530</td>
<td>0.050</td>
<td>0.580</td>
<td>:: 1 : 1.2</td>
</tr>
<tr>
<td>Toad</td>
<td>0.065</td>
<td>0.110</td>
<td>0.028</td>
<td>0.148</td>
<td>:: 1 : 2.2</td>
</tr>
<tr>
<td>Frog</td>
<td>0.070</td>
<td>0.100</td>
<td>0.034</td>
<td>0.134</td>
<td>:: 1 : 2.5</td>
</tr>
<tr>
<td>Tadpole of the frog</td>
<td>0.035</td>
<td>0.300</td>
<td>0.050</td>
<td>0.330</td>
<td>:: 1 : 9.7</td>
</tr>
<tr>
<td>Salamander</td>
<td>0.040</td>
<td>0.080</td>
<td>0.022</td>
<td>0.102</td>
<td>:: 1 : 2.5</td>
</tr>
</tbody>
</table>

* In a common snake of four feet in length, Blumenbach found the intestinal canal about three feet, nearly straight, or at least very slightly undulated: its proportional length was therefore different from that expressed in the table. Specimen Physiol. Comp. p. 30.

The intestinal canal of reptiles has in general no appendix to mark its division into large and small intestines; this division exists nevertheless in most of them. All the chelonians, most of the saurians, and the batracians, with the exception of the Irian lacertina, have a long and slender intestine, inserted into a large and short intestine, and commonly prolonged into the cavity, so as to form a circular margin of a valve-like form. The sides of the large intestine are almost always thicker and stronger than those of the small. The membranes differ too; the muscular in respect to its longitudinal fibres, and the internal in its folds. The iguana is the only animal of this class, in which a true cecum has been noticed.

_of the Intestinal Canal._ — All reptiles have the intestinal canal very short, but not of the same diameter in its whole length. In the first and most considerable portion, the capacity is much inferior to that which is found to propel near its termination; so that it may be divided, as in the mammals, into small and large intestines. A circular valve is most frequently found separating the two divisions; it is formed by a prolongation of the small intestine, which becomes dilated, and sometimes is extended into a kind of sac, projecting more or less into the cavity of the large intestine, and rendering the parietes double at that part. It is thus found in the Schneiderian coccin.

In tortoises, the diameter of the small intestine gradually diminishes from the pylorus to the point of its insertion into the large; the area of which is four times greater than that of the small, and its parietes have the same structure as in the other reptiles. The cavity is regular throughout, there being no partial dilations or sacculi. The internal membrane has folds, more or less broad, and of a membranous structure, in different species, sometimes connected in a reticular form at the commencement of the small intestine, having a longitudinal and parallel direction in the rest of its extent, and arranged more or less irregularly in the large. The large intestine proceeds in a straight direction to the anus, whilst the small makes many irregular turns in its course.

Blumenbach found the intestinal canal of the hawk's-bill turtle (testudo caretta) five times as long as the whole animal. The small intestine, as it is called, was larger than the short portion of the large intestine; the whole internal surface was covered internally with an abundance of mucus. *Syst. of Comp. Anat.* p. 173.

The internal coat of the intestine of the turtle is covered with innumerable thin longitudinal procne[sic]s, lying close together, and increasing the surface of the gut to a vast extent. They are most numerous in the upper part of the canal, and gradually diminish in number, until they cease altogether, below. In the latter respect they resemble the valvular comminutes of men, and the villi of all animals. For these structures are always most distinct at the commencement of the canal, where absorption goes on to the greatest extent. The alimentary matter is deprived more and more of its nutritious parts, as it descends in the intestine; and hence a less extensive absorbing surface is sufficient, in the lower part of the canal, for taking up the remains of really nutritious particles. Yet Blumenbach says that he found these folds so numerous in the rectum of the hawk's-bill turtle, that a section of the gut resembled a broad radiated band. *Lib. cit. p. 173,* note.

In the crocodile of the Nile, the small intestine may be distinguished into two portions, the one more capacious, having thinner coats, and making four turns in such a manner as to form four permanent angles; the other, more contracted and having thicker parietes, inclines between its internal and muscular coats a layer of glandular substance, semi-transparent, of a grey colour and pulpy consistence. In the internal membrane lining the glandular substance, there are seen longitudinal folds arranged in a zigzag form, and connected together laterally, by smaller folds, so as to form a reticular surface. In the first portion of the small intestine, where the glandular substance is not manifest, the folds arranged in a zigzag form are replaced by fine villous eminences. Near the termination of the small intestine there are only seen some waving folds, connected by a few, proceeding transversely. In the large intestine, the folds are arranged irreglarly, forming a velvet-like surface.

The form of the rectum (under which term is included the large intestine of fishes and reptiles) is cylindrical in the crocodile of the Nile; and the small intestine, where inserted into it, is nearly of equal diameter. In the gavial
REPTILES.

(Gangetic crocodile), the large intestine has a pyriform figure, the termination of the small being inserted into its broadest part.

In the lizards, the rectum is cylindrical, and much broader than the small intestine which is inserted into it; the latter, after having turned forwards from the pylorus, is folded backwards, and proceeds in a tortuous and undulating direction as far as the rectum, which pursues a straight course to the anus. The parietes of the intestinal canal are thin and transparent; the internal membrane has folds arranged in a zigzag form.

In the chamelons, the coats of the intestine have the same structure; the capacity of the small is not much inferior to that of the flomach and large intestine, in the greatest part of its extent; but it becomes much contracted a little before its insertion into the latter. There is no valve indicating the separation between the different portions; the internal membrane has waving folds, the loose edges of which have a fringed appearance; they are directed longitudinally, and contracting as they approach the rectum, disappear at a certain distance from that intestine, where the internal membrane becomes smooth and without any folds. The mucular coat is thicker in the rectum than in the small intestine, where it is indistinct. The cellular coat is not manifest.

In the dragon, the intestinal canal forms two turns and a half before it arrives at the anus; the commencement is distinguished only by the different appearance of its coats, which are much thinner than those of the flomach.

In the iguana, the parietes of the intestinal canals are thin and transparent, gradually contracting from the pylorus to the insertion of the small intestine into the rectum; the latter is of an elongated form, but contracted at one part, by which it becomes divided into two portions almost of a cylindrical shape. The internal membrane has some folds directed longitudinally in the small intestine. In the common iguana, which has the intestinal canal long and very capacious, there is a true cæcum, distinguishable from the large intestine by the greater thickness of its coats, and by a partition separating their cavities, so that it is through a very narrow orifice that the fecal matter passes from the cæcum into the succeeding part of the large intestine. The intestine of the small intestine into the former takes place near its middle. The coats of the cæcum have in some degree a facculated form. The internal surface is smooth and without folds. In the large intestine the internal membrane has the same structure, except at the commencement, where there are found about six transverse valves, which do not extend around the whole tube of the intestine. In the small intestine there are longitudinal folds. The pouch formed by the cæcum is about three-fourths of an inch in length, and twice as much in breadth.

In the gekko a goutteletes the parietes of the intestine are also transparent, the small has but little capacity, but is unequal at different parts; it is inserted into the centre of the first portion of the large intestine, which is of a globular form; and is separated, by a contraction in its coats, from the second portion, which is elongated and oval, the small extremity corresponding to the anus. In the Schneiderian feinik the thin and tender coats of the intestinal canal are much dilated at the commencement of the small intestine, and contracted at the part where it is introduced into the large. We have already mentioned that it is dilated into the form of a bladder, and enveloped by the first portion of the large intestine, similarly dilated. The excrements, which pass through the small aperture in the vesicular dilatation of the small intestine, find their way partly into the interval between the latter and the internal surface of the large. Beyond the first portion the rectum becomes cylindrical. The small intestine is divided into many pouches by contractions which pretty nearly correspond to its different turns.

In the ophidian order the intestinal canal pursues a perpendiculare direction as far as the rectum, and prefers nearly the same diameter throughout, dilating but little in the large intestine. In the small, the internal membrane forms broad longitudinal layers, folded in the manner of ruffles; it is rugous, and in the rectum forms thick, irregular folds, which are continued to the anus. In the coluber natrix, according to Blumenbach, the whole length of the intestinal canal does not equal that of the animal. The small intestine forms a very considerable valve at its entrance into the large. Lib. cit. p. 174.

In the salamanders, the small intestine is very narrow in comparison with the rectum, where the internal membrane forms thick and fringed folds. In toads and frogs, we find a nearly analogous conformation and structure, there being only a slight variation in the form of the rectum, which is more or less of a conical or pyriform shape, as in many frogs, or cylindrical, as in toads. But in the tadpoles of both, the intestinal canal is altogether very different from that of the same animal in the perfect state. Long, narrow, and nearly of uniform diameter in the small intestine, making irregular turns in its course, its volume augments at the rectum, which becomes of a facculated form, and makes two spiral turns upon itself, before it proceeds to the anus. There is no valve separating the two portions of the intestine.

In the first lacertina the intestinal canal proceeds almost in a straight course from the pylorus to the anus, making but one small turn near its middle, from which it proceeds straight to its termination. Its coats are transparent, and its diameter nearly equal throughout, not admitting of any division into small and large intestines.

Physiology of the Digestive Organ.—Blumenbach affirms that most reptiles are omnivorous, while some are confined to one species of food, as the bufon ova or rana calamita, which feeds on a few species only of insects, and is an aerial. (Specimen Physiol. Comp. p. 29.) We cannot help doubting the accuracy of the first part of this statement: the food seems to us almost entirely animal. Serpents, frogs, and lizards, live on the smaller animals or insects; and even the turtles, which eat particular kinds of marine plants, feed also on the molluscs. The simple stomachs, the simple and short alimentary canals of the whole order, correspond very clearly to what we understand concerning their carnivorous habits. Newts seem to care for living insects and worms only, which they seize with their jaws, and swallow whole.

Two apparently contradictory circumstances have been noticed in this order; great voracity in many instances, but in all a wonderful power of abstinence. Salamanders sometimes devour their own excrement, and earth. Serpents often take in a quantity of food, which distends their bodies inordinately, and leaves them inactive, and hardly capable of motion. The salamanders will sometimes stuff themselves to such a degree with worms, that they crawl up again out of their stomachs. See Spallanzani's Dissertations, vol. i. p. 110.

"A newt," says Bonnet, "having devoured a large earthen worm, I supplied it with another above four inches long, and thick in proportion. It immediately swallowed the whole, except a line or two that hung out of the mouth; but the worm was soon thrown up, and the fame repeated twice, but the worm still lived." Spallanzani's Traité, vol. ii. p. 366.

The intestines which are recorded of the abstinence of reptiles seem at first almost incredible. Not to mention the toads,
toads which have been found inclosed in blocks of stone, and which probably have been in a torpid state, nor the more common instances (see L. Th. Gronovius ad Plinium de Aquarium Natura, p. 38.) we have the respectable authority of Caldeif for the fact of tortoises having remained without food, and not in a torpid state, for a year and a half. Blumenbach reports of a tortoise, which he kept for three quarters of a year, that the harmless creature never ate anything the whole time, although every thing that the house and garden afforded was offered to him. For the last three months (from November to February) he exhibited the lowest degree of vitality, manifested, in addition to extremely slow locomotion, with almost cloased eye-lids, merely by the fingle sense of touch or feeling, particularly of warmth and drafts of air. When he died, the muscles were as fleshy and fresh-coloured as in the best nourished tortoises. Abbildungen, &c. No. 66.

Redi had a land tortoise live eighteen months, a camel alone, and vipers ten, without food. (Spallanzani's Traicts, Introduftion, p. 42.) Toads were quite lively at the end of fourteen and eighteen months, inclosed in pots. Ibid.

Blafius mentions, in his "Anatonia Animalium," that a land tortoife which he kept nine months would take no food during the whole time.

Bonnet, speaking of newts, says, "these animals can support the want of food very long. Some of mine have lived two months without it. Sign. Spallanzani had remarked the fame; and observed, that although long deprived of nutriment, they reproduced their members equally well as those plentifully supplied with futterance." (Spallanzani's Traicts, v. 2. p. 96.) Blumenbach has kept four newts eight months without taking food, or appearing to suffer from the want of it. (Handbuch der Natur gefchichte, p. 229.) Daudin afferts that snakes and vipers may be kept for fix months without food, yet seem to lose none of their activity: t. 1. Introd. p. 270.

Some protea, which Dr. Schreiber of Vienna had kept in his possession for two years, had taken no food, and were quite well. (Cuvier, Rech. fur quelques Rept. douteux; L'Anat. du Prét.) Bruce states that he had kept the cerales in a bottle for two years without food, and Lacépède reports, on the authority of Shaw, that a Venetian apothecary kept two of these fasting for five years. (See Daudin, vol. vi. p. 186.) This power of fasting belongs, in a greater or lefs degree, to the whole order. For a comparison between the power of abstinence of warm-blooded animals and reptiles (the rate of torpidity being excpected), see Diff. Academ. Inftit. Bonon. ap Benedicium 14. Pont. Max. de fervor. Dei Beatiatations, lib. 4. p. 1. pag. 328; also Baccarius in Comm. Inftit. Bonon. t. 2. p. 1. pag. 223.

No reptiles malticate: the herbivorous amphibia gnaw off the vegetable productions on which they feed, but they do not chew them. The structure of their jaws, teeth, and tongue, gives them the power of swallowsing entire animals: this process of deglutition, being often exercisef on animals as broad as themselves, and broader, is very flow, and occupies even hours. The oesophagus mult of course posses a great power of dilatation. In his account of the newt, Bonnet says, "that worms are feized with a sudden motion of the animal's jaws, and swallowed alive, with gentle shocks of the whole body, and particularly of the anterior part. The prey is always swallowed without malagination; the minute teeth, which are not employed in chewing, ferve to prevent the escape of the animal, which twits itself about most actively. Long worms are devoured entire, notwithstanding all their exertions to escape. They twine round the neck of the newt like a serpent: every moment they become shorter, and gradually disappear. Thus have I seen a newt swallow a worm more than six inches long in less than five minutes. A large worm, feized by the middle, is seldom swallowed in the fame position, because it is too large, if doubled in the mouth, and the newt gradually shakes it out, until it can seize one of the extremities; which being accomplished, the worm is soon devoured. However, I have observed a large one swallow a worm taken with the middle, without feizing an extremity; but a quarter of an hour was occupied in the meal. The successfve motions of deglutition are very fensitive; it is performed by repeated floucks. Though they have flexible jointed fingers, they make no use of the hand, either to seize their prey, convey it to the mouth, or retain it there." Spallanzani's Traicts, v. 2. p. 364.

The length and capacity of this tube, and its large communication with the stomack, are well suited to the nature of serpents. The prey, always swallowed without malfication, is often too long to pass entirely into the stomack: it remains in the oesophagus until room is made for it. Travellers have even alferred that one end of an animal sometimes hangs out of a serpent's mouth, while the other is in the stomack.

As there is no malfication in this clafs, nor any provifion like the gizzard of birds, for comminuting the food when swallowed, the proces of digestion must be effected by the action of the stomack alone on the prey swallowed entire. The juices of the organ are fully adequate to this effect; and the proces has been demonstrated by experiment in several genera by Spallanzani. He inclosed food in tubes, and conveyed them into the stomack of the frog, the newt, and different serpents; and always found that it was dissoluted in a longer or shorter time: it thus appears that the effential nature of digestion is the fame as in the warm-blooded animals: but the proces exhibition some modifications, as the different nature and habits of the animals would naturally lead us to expect. The chief difference is that the solution requires a considerably longer time than in warm-blooded animals. The flesh in the tubes, conveyed into the stomachs of frogs, was not completely dissolved until the third and even the fifth day. (Differtations, v. 1. p. 102.) Yet although the garlick liquor of frogs acts fo flowly, it is capable in time of dissolving even bone: Spallanzani met with a mouse in the stomack of a frog; all the soft parts of the limbs were gone, so as to have only the naked bones, which were considerably walked, and converted into a femi-gelatinous fubstance. (Ibid. p. 102.) Earth-worms inclosed in tubes were converted into a whitish pulp in thirty hours, in the stomack of the water newt; p. 104. He found numerous small white worms in the stomachs of three-fourths of all the newts he examined, from five or fix in number to a hundred and more. These were fo delicate that they would not bear even flightPrefure; and thus afford a proof that nothing like trituration can go on in the stomack, but that digestion is simply solution by the garlick liquor; p. 104—111. In serpents the proces occupied from two to five days. The tubiz of frogs were almoft completely dissoluted in five days; § 118 —122. As the animals swallowed by serpents often lie in part in the oesophagus, a quetion arifes, whether they undergo any digestion in that tube, or whether this function be the exclusive attribute of the stomack. A viper, says Charas (Deferip. Anat. de la Vipere), vomited a lizard, which had been swallowed twelve days before. All the front of the body, which had been in the stomack, had merely
merely the bones remaining, while the other parts were
nearly as perfect as if they had been swallowed the same
day. Spallanzani confirmed this want of digestive power
in the ophæopods, by direct experiment: § 125. Natu-
ralists, by this indefatigable inquirer, were already ap-
prized of the tardsiness of digestion in serpents. Bomare,
in his Dict. d'Hilt. Naturelle, gives an account of a ser-
pent at Martinique, which retained a chicken in its stom-
ach for three months, and did not completely digest it. "It
is remarkable that flesh does not become fossil from remain-
ning long in the stomachs of these cold animals, which I
had occasion to observe particularly in a viper. A lizard
was retained in its stomach for sixteen days, at the end of
which time it had no odour but that of the gallic juice. Yet
such was the heat of the season, that another lizard, which
I had placed in a close vessel, containing a little water, em-
itted an unsupportable bench before the expiration of the third
day; § 127. The gallic liquor of a snake approaches in
colour to that of foot; it had the fluidity of water, and
evaporated very slowly; it had both a salt and bitter taste,
and was not inflammable. It strongly resembled the gallic
fluid of other animals, and this resemblance extended to the
odour, which was exactly like that of the corresponding
juices of birds of prey; § 123.

The idea of Blumenbach, that the venom of the poison-
ous serpents supplies the place of maflication, and promotes
digestion by some septic power, seems completely unfounded.
It is a provision calculated merely for purposes of offence.
Where is this septic power, or what supplies its place in the
harmless serpents, and in all other amphibia?

The whole alimentary canal of the amphibia abounds
with a viscid tenacious mucus, the abode of several gener
of worms.

Blumenbach failed completely in very numerous and
diversified attempts to cram frogs and lizards with madder
root, and thus to produce in their bones that beautiful rosy
colour, which is so quickly produced in the mammalia of
birds, when thus fed. Specimen Physicol. p. 31.

Absorbing Vessels. — This system has been very little exa-
nined by anatomists, probably on account of the minute-
ness of the tubes, and the consequent difficulty of injecting
them. We have nothing to add to the account given by
Hewson, who first described them in the Philological
Transact. 1760.

No lymphatic gland has been yet seen in a reptile: birds
have none in their mesentery, but they are seen connected
to the large lymphatics of the neck.

It has been ascertained that the chyle is colourless, and hence
anatomists have explained why the vessels were so long un-
discovered. In animals which have white chyle, the ap-
pearance of this fluid through the transparent coats of the
laëcles supplys the place of injection, and affords an easy
method of demonstrating them. Mr. Hewson states that he
faw white chyle in a crocodile.

The distribution of the laëcles (if that term may be
employed where the chyle, instead of being like milk, is
transparent) on the intestine of the turtle, forms one of the
most elegant preparations in comparative anatomy. By
fixing the injecting tube in a vessel near the intestine, and
waiting with a little patience, the quicksilver will gradually
find its way into the minute ramifications of the laëcles.
The large trunks on the mesentery contain valves, so that
we cannot force in filling the absorbents of the intestine
from them; but the ramifications on the intestine itself are
definite of these folds, so that when once the quicksilver
has reached the surface of the gut, it will run forward with-
out any obstacle. The peritoneal surface of the gut is com-
pletely covered with straight parallel branches, running
according to the length of the intestine. Its inner surface
is no less thickly covered with laëcles of a different appear-
ance. When dried it seems as if the quicksilver were con-
tained in small cells, covering the whole internal surface
of the intestine so completely, that the point of a pin could
scarcely be placed between them. Mr. Hewson has particu-
larly described this appearance, and was doubtful whether
it ought to be referred to extravasation or not. But we are
convinced, from frequent examinations of this cellular struc-
ture, that it is a part of the natural organization; because
the cells are regular and uniform in their size and arrange-
ment; no force is used in the experiment; and a real extra-
vasation presents an appearance altogether different.
The extent of the absorbing system, as demonstrated in this way,
is beyond any thing we could form an idea of from injections
in man or warm-blooded animals.

After leaving the intestine, the laëcles accompany the
blood-vessels on the mesentery, running at their sides, and
communicating across them. Each artery has two veins,
and there is a laëcel or more at each side of each of the
three vessels; so that their number considerably exceeds that
of the blood-vessels. A coarse representation of them, on
the mesentery, is exhibited in Monro's Physiologie of Fishes,
tab. 30.

Near the root of the mesentery the large laëcles analo-
tomof, so as to form a net-work, from which several large
branches go into some considerable lymphatics on the left
side of the spine. These last can be traced downwards
almost to the anus, and belong to the parts situated below the
mesentery, and particularly to the kidneys. At the root of the
mesentery, on the left side of the spine, the lymphatics of
the spleen join the laëcles, and immediately above this
union a fort of plexus or net-work is formed, which lies
upon the right aorta. From this plexus a large branch arises,
which passes behind the right aorta to the left side, and
gets before the left aorta, where it affilts in forming a large
receptaculum, lying in front of that artery. The thoracic
ducts arise from this receptaculum. From its right side goes
one trunk, which is joined by that large branch which came
from the plexus to the left side of the right aorta, and then
passes over the spine. This trunk is the thoracic duct of
the right side; for having got to the right side of the spine,
it runs upwards on the inside of the right aorta, towards the
right sublubain vein. And when it has advanced a little
above the lungs, or within three or four inches of the sub-
lubain vein, it divides into branches, which, near the fame
place, are joined by a large branch that comes up on the outside
of the aorta. From this part upwards, those vessels divide and
subdivide, and are afterwards joined by the lymphatics
of the neck, which likewise divide into branches before
they join those from below; so that between the thoracic
duct and the lymphatics of the fame side of the neck a very
intricate net-work is formed. From this net-work a branch
goes into the angle made by the jugular vein, and the lower
part, or trunk, of the sublubain: this branch, therefore,
lies on the inside of the jugular, whilist another gets to the
outside of that vein, and seems to open into it a little above
the angle between that vein and the sublubain. Into the
above-mentioned receptaculum the lymphatics of the flomach
and duodenum enter: they have numerous anatomic boxes,
forming a beautiful net-work round the artery which they
accompany. From this receptaculum likewise, beside the
trunk already mentioned, which goes to the right side,
arise two other trunks, nearly equal in size; one of which
runs upon the left side, and the other upon the right side of the
left aorta, till they come within two or three inches of the
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left subclavian vein; where they join behind the aorta, and form a number of branches, which are afterwards joined by the lymphatics of the left side of the neck: so that here a net-work or plexus is formed, as upon the right side. From this plexus a branch issues, which opens into the angle between the jugular and the lower part or trunk of the subclavian vein. In these net-works, formed by the lymphatics near their termination in the veins, this system in the turtle differs remarkably from that in birds. Hewson's Account of the Lymphatic System in Amphibious Animals, Philos. Trans. vol. 69. p. 198.

The Liver, which is divided in the mammals into several lobes distinct from each other, and is more uniform in birds, is still less divided in reptiles. Often it has no division of lobes, but is merely irregularly suffused on its loose and thin edge. Its proportionate size, however, is more considerable than in the two classes just mentioned. Occupying usually the two hypochondria, it extends far backwards under the intestines, and is supported in its position by folds of the peritoneum, analogous to those which exist in the mammals. Its colour is no longer that reddish-brown which is seen in the mammalia and birds; but it partakes more of yellow.

In the cheloniens the liver exhibits a peculiar arrangement, being divided into two rounded irregular masses, of which the right occupies the same hypochondrium, and the other is connected to the small curvature of the flomach. They are united by two narrow productions of the same substance, in which the principal vessels pass. In the green lizard, the gekos, the dragons, the iguanas, it forms a single mass of various figure, flat or convex below, concave above. Its loose edge has two fissures in the dragon, dividing it into three lobes, of which the right is prolonged into a sort of tail. There is only one fissure in the gekos, and the right part is equally more extensive than the left. In the common iguana it is lengthened into a long appendix. In the crocodile and camelion the liver has two very distinct lobes; and moreover, in the latter, a long appendix. It has only one lobe in the serpents, in whom it is long and cylindrical. Like other organs, it assumes in this order a figure corresponding to the elongated form of their bodies. There is one lobe only in the falamanders, but two in the other batracians.

Hepatic Canals.—The common trunk of these canals is usually separate from the cystic duct, and not infected with the latter in the intestinal canal, in reptiles, as well as in birds. This has been observed in the cheloniens and faurian orders, in several ophiidians, and some batracians. Yet this arrangement is not constant. For, in the crocodile, where the hepatic is sometimes separate from the cystic duct, it tends at other times a branch to the gall-bladder, which is infected a little above its neck, and is itself united to the cystic canal, not far from the intestine. The mouth of the common canal was distant from the pylorus, says Cuvier, 0.26 in a crocodile, whose whole intestinal canal was rather more than a metre (about 34½ inches) in length.

In the testudo græca the hepatic canal sends a branch of communication to the cystic canal, not far from the gall-bladder; but these two canals open separately into the intestine, though near each other; the former before the latter.

The Gall-Bladder has its fundus usually directed backwards. Its proportional volume is less considerable than in mammalia and birds; and it is more intimately connected with the liver than in these classes. In the testudines it is almost entirely concealed in the right lobe of the viscæ; and is placed under the same lobe in the crocodile. Where the liver is not divided into lobes, the situation of this refer-
The mefenery exhibits, in the different orders of reptiles, some varieties, which we shall shortly notice. The first fold, which is attached to the small intestine in the teuidines, does not come immediately from the vertebral column, and does not form the mefenery properly so called, until after it has fixed the arch of the colon by means of a mesocolon. The duodenum is confined in the right hypochondrium, and loins, by lamina of the common membrane, which cover it, and are then continued to the abdominal parietes. The mefenery of serpents is a narrow fold, not coming immediately from the vertebral column; the blood-veils form numerous anastomoses between its lamina, as in warm-blooded animals.

The faurus have a mefenery tolerably developed. The production, which goes to the large intestine, like that which belongs to the small, comes from the vertebral column. There is no transverse mesocolon.

Reptiles have no omenta; but their structures apparently analogous to these fatty membranes occur in some of them. The serpents have membranous procaces, containing much fat, and extending, like the great omentum of the mammalia, under the intestinal canal. Many faurus have also two productions of peritoneum, loaded with fat, advancing from the front edge of the pelvis under the abdominal visera; there are fatty lobes attached to the tefticles and ovaries of frogs. The latter are not regarded by Blumenbach in the light of omenta. "The yellow appendices," says he, "ducus adipoj, appendices luteae," which are found in the frog, on either side of the spine, and sometimes form one mass, sometimes are divided into several smaller portions, were confidered by Malpighi as a kind of omentum. (De omento et adipoj ductibus, oper. 1. 2. p. 35, &c.) That this resemblance is very remote, appears from several circumstances; and particularly from the conf tant and remarkable variations of size which occur in these parts at the pairing season. Comparative Anatomy, translated by Lawrence, p. 193.

These bodies, being apparently connected to the tefticles and ovaries, are described with the generative organs by Swammerdam and Roefel. They confift of a pedicle, attached more particularly to the emulent vein on each side, and of two, three, to seven or more pieces joined to it, varying in size according to the age and season. They are proportionally large in the tadpole. They may be feen small in female frogs, which have not yet laid their ova, although Roefel afferts that they penetrate in size with the generative organs. In this small state, Cuvier observes, that a vejel, filled with venous blood, and producing no branches, may be feen in the axis of each fringed portion. These veins all join to form a common trunk in the pedicle; and this trunk terminates in the emulent vein.

The absence of omentum in this class does not accord with its supposed use to keep the intestines warm. Is there any proof that the intestines are warmer with it, than they would be without it? And is there not as great a necessity for preventing the escape of heat in reptiles, or in birds, (which also have no omentum,) as in the mammalia? Cuvier observes, that many of the hybernating mammalia have two lateral omental appendices, which, with the principal omentum, are abundantly furnished with fat in the winter, so as to form "an adipous covering for the intestines, which no doubt contributes powerfully to retain their natural heat, to prevent the access of cold, and to supply the place of food." All reptiles are torpid in the winter, yet they have no omenta.

Urinary Organs.

The Kidneys.—These are distinguished from the same glands in mammalia, and resemble those of birds and fishes, in the impossibility of distinguishing in them the two functions (see Kidney), and in the absence of infundibula and pelvis. Their situation, form, and relative size, vary in the different orders.

In the chelonians and faurus, they lie far back in the abdominal cavity. They adhere closely to the pelvis in the lizards properly so called, under the fcarum, and penetrate even under the tail; they go as far back, but they advance farther in front, in the salamanders. They lie altogether farther forwards, and very near each other, in the other batracians. In these three orders both kidneys are situated at the fane height, and covered by the peritoneum on their inferior surface only. In the opifhids, the right is placed further forwards than the left; and they are connected, on each side of the vertebral column, merely by a prolongation of peritoneum, which furrounds and fupends them, without fixing them to the spine. There is a manifest relation between the peculiar arrangement, and the great mobility of the column in these animals.

Their form is short and thick in the chelonians, more or less elongated and flattened oval in the faurus and batracians, and extremely elongated in the opifhids. They confift, in the latter, of numerous separate lobes, placed in a chain one before the other. They are also minutely divided in the chelonians, at least on their two surfaces; for all the lobes are united in the centre. They form, on their surface, a kind of convolutions resembling thofe of the brain, and giving the glands a peculiar aspect.

Among the faurus, the crocodiles have them much divided, at least at a certain age. In a small crocodile, about a foot in length, Cuvier faw no division, while there were many in a larger individual of the fame species. It would be fingular if this fhoold turn out to be a conflant difference, as it is exactly the converse of that which exists in man. They are without lobes, or only slightly divided in other genera of the fame order. They have no divisions in the batracians.

The origin of the ureters is analogous to that of birds; and their length varies according to the situation of the kidneies.

They end in the urethra in the chelonians, and the urine passes from that canal into the bladder.

They are short, large, and thick-fided in the crocodile, and pierce the superior surface of the cloaca, at a considerable distance from each other.

The principal ramifications of the urinary canals are easily seen in the opifhids, ending successively, as they come out of each lobe, in a common trunk, which follows the internal edge of the kidney, and forms the ureter. Arriving near the cloaca, each is dilated into a small oval bag, and then terminates separately.

In general they terminate in the cloaca or bladder, according as the latter refervoir exists or not.

Urinary Bladder.—Reptiles vary much in refpeft to the existence of this part. The chelonian and batrachian orders have it: and it is found in the following genera of faurus; víz. the iguana, tupinambis, camelon, drayon, fëlëlio: while it is wanting in the crocodile, lizard, agame, gecxo, other genera of the fame order; and in the opifhids.

The bladder is very large, with thin fides and weak muscular fibres in the chelonians; and it has a more or less marked division at its fundus into two portions. A very short urethra opens on the inferior surface of the cloaca; its cavity presents two prominences on each side, of which the anterior is pierced by the orifice of the vas deferens, the posterior by that of the ureter.
The bladder always receives the urine by its neck, or by a beginning of an urethra, which opens immediately into the cloaca.

There are two large membranous bags in the frog and toad, occupying the situation of the urinary bladder, generally considered as such, and so described by Blumenbach and Cuvier. Townson doubts whether they ought to be considered as part of the urinary apparatus. (See his Traits and Observations, p. 66. tab. 3.) They have no connection with the ureters. Indeed it is very clear, that the latter tubes open on the superior surface; while these two receptacles terminate on the inferior surface of that tinctile. They contain a pure water. Their fize, which exceeds all ordinary proportion to the bulk of the kidney, renders it likewise probable that they are not receptacles of urine.

RENAL CAPSULES.—The parts to which this name has been given, and which are found in the three first orders of reptiles, are still smaller in proportion, than in mammalia and birds, and are completely separate from the kidneys. In the chelonians they are connected to the emunctory veins. In the saurians and ophidians they lie in the fold of the peritoneum, which unites the umbilicus and oviducts.

For a description of the fringed fatty appendices, which are found in the batarian order near the teficles and ovaries, and the vesicles of which join the emunctory veins, see the account of the omenta.

Organs of Circulation.—The whole of nutrition is effected at one operation in zoophytes: chyle passes into the parts in proportion as it is made; in insects also it bathes them as soon as it is formed, and they appropriate it. In the superior animals, there is an intermediate operation: a particular fluid only, always moving in a certain sytem of vesicles, immediately nourishes the parts; and this fluid is renewed by the chyle. The motion of this peculiar fluid, of this blood, is called circulation;—a process confined to the superior classes, that is, to the vertebral animals, the mollusca, the worms, and the crustacea.

There are two principal points for our consideration in the circulation: its agents, and the routes of the blood.

That part of the latter is particularly interesting, which conducts the blood to the respiratory organ. One of the chief purposes of the circulation is to conduct the blood constantly, in greater or smaller quantity, into an organ, where it may undergo the mediate or immediate action of oxygen; and, as the quantities of the blood depend much on the degree of force of this action, and in the modification which the blood receives from it, while all parts of the body, being nourished by this blood, partake of its qualities, it follows that the whole nature of an animal will be in some part determined by the distribution of its circulating organs, and by the route which this distribution marks out for the blood.

Hence arises the importance of the structure of the heart, in reference to natural history, and the correctness of the characters drawn from it for the formation of classes. Men of genius had foreseen, rather than demonstrated this importance; but it has been established on rational principles only in modern times.

The communications through the body and the lung are called, respectively, the great and the minor. In the former, all the blood returning from the body by the veins, which joining together from all parts, ultimately end in one trunk, goes again to these parts by the arteries, of which a common trunk is gradually divided and sub-divided, until the last divisions, as well as their union with the roots of the veins, escape the eye.

If the common trunk of the veins communicated directly with the common arterial trunk, there would be a single circulation; the blood brought back to the centre, would be sent again immediately to the parts, to return again directly, and so on; but this never takes place entirely.

Before the blood, brought back to the common trunk of the veins, can again enter that of the arteries, it must be sent in part, or altogether, to the pulmonary organ, in order to undergo the action of the atmosphere.

If the circulating organs be so arranged that every drop of the blood goes through the lung, by the minor circulation, before it can enter the arterial trunk, the common trunk of the veins of the body sending all its blood into the pulmonary arterial trunk, whose ultimate ramifications communicate with veins united into a common trunk, sending all its blood into that of the arteries of the body, there is a double circulation.

If, on the contrary, the common trunk of the general veins, instead of being distributed entirely to the lung, should only send to it a branch, while the rest of its blood should go directly into the common trunk of the general arteries, the minor circulation would be only a fraction of the great, more or less considerable, according to the size of the branch devoted to it. In each circuit of the blood, respiration would be exercised on a part only of this fluid, and the rest would go again into the body by the arteries, without having passed through the lung. This blood, and the parts nourished by it, would participate less, ceteris paribus, in the qualities which respiration could impart to it. This is what takes place in reptiles; their pulmonary circulation is only a fraction of the great, more or less considerable in the different genera. The other clades, viz. the mammalia, birds, fishes, mollusca, and worms, have a double circulation, and no part of their blood can return into the great, until it has gone through the minor circulation.

Yet we are not to conclude that the ultimate effect of respiration is the same, because circulation is the same. The mode of respiration may be different, and, as this is one of the factors, the product will be affected by its alteration. All the animals hitherto enumerated have an entire pulmonary circulation, while, in reptiles, it is only a fraction; let them be, for example, as 1 to 2. Now fishes, mollusca, and worms, breathing in water, and that oxygen only, which is mixed and contained in this water, may be considered as having a half-respiration, while reptiles, breathing air itself, have an entire one. An entire respiration, multiplied by a half-circulation, and a half-circulation by an entire respiration, give the same product; which is, in both cases, a half-oxygenation of the blood, using this term merely to express the changes taking place from breathing.

Mammalia have an entire circulation and respiration; and consequently an entire oxygenation. The quantity of the latter is even greater in birds by consequence of the peculiar manner in which air is introduced into all parts of their body.

The fraction of 1/2 is only adopted for the purpose of illustration; the quantity probably varies in the different genera of each clade, and cannot be rigorously appreciated.

By these considerations we may estimate, and in a manner calculate, the nature of each animal. As respiration gives to the blood its heat and energy, and through its medium imparts excitability to the organs, its quantity will determine the degree of vigour in the animal functions. Hence we deduce the great force of the moving powers, the acuteness of the fleshes, the rapidity of digestion, and the heat of the passions in birds. Hence the more moderate degree of all these in the mammalia; hence the inertness, the inactivity, and apparent stupidity, of the other clades. Hence, too, the various modifications of vital temperature natural to each
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each of these classes, which are in exact ratio to the degree of their other qualities.

The circulation is effected by means of muscular powers, which are applied particularly to the arterial system; the venous seeming to be merely passive. A hollow muscle, called a ventricle, poising great and continued irritability, and contracting forcibly on the blood whenever it arrives, is placed at the union of the venous and the corresponding arterial trunk. Valves are placed at its two openings; one valve allows the blood to enter, and prevents it from going back again, while the other permits its exit, and cuts off the return. The ventricle then cannot contract without dividing the arteries, pushing forwards the blood, which they contain already, and thus producing the pulse. The ventricle, having expelled the blood which irritated it, is relaxed and dilated, and then immediately filled with a fresh quantity of blood from the veins. Before entering the ventricle, the vein is dilated into a muscular sac, called the auricle, with much less considerable muscular sides. This is irritated by the blood received from the vein, contracts on it, and sends it into the ventricle. It is hardly necessary to add, that the auricle and ventricle contract alternately.

Animals with a simple circulation have a single ventricle; but they possess sometimes two auricles. When the circulation is double, there may be a ventricle at the origin of each artery, or at that of one only. Mammalia and birds have two, and the sepia among the mollusca.

All other animals have a ventricle at the origin of one only of the two arteries, but not of the same in all. It is placed, in fishes, at the origin of the pulmonary artery; in the mollusca at the origin of the artery of the body, or the aorta, which is the name of that artery.

The union of the auricle and ventricle constitutes the heart. We find, therefore, in fishes and mollusca, a simple heart, pulmonary in the former, aortic in the latter. Reptiles, also, have a simple heart, at once pulmonary and aortic. Mammalia, birds, and sepia, have a double heart, or rather two, a pulmonary and an aortic, hearts.

In mammals and birds the two hearts are united, and form one mass, which commonly bears the name of heart, as if it were a single organ. This is not the case in the sepia. See VERMES, in Comparative Anatomy.

We may now understand what naturalists mean, when they say that mammals and birds have a heart with two auricles and two ventricles; reptiles and fishes a heart with a single auricle and ventricle. The latter phrase, besides comprising, in a common expression, two things really very different, contains also an error of fact; for many reptiles have two auricles.

Respecting the hearts of mammals, birds, fishes, and mollusca, see the articles MAMMALIA, BIRDS, FISHES, and VERMES, in Comparative Anatomy. For the physiology of the circulation, the powers and actions of the heart, and the other organs concerned in it, see CIRCULATION and HEART.

The essential structure of the heart is the same in all animals; there are only modifications of greater or less importance. It is covered externally by a smooth membrane, the reflected portion of the pericardium; its cavities are lined by another smooth membrane, continuous with the linings of the blood-vessels; and there is more or less muscular substance interpolated between them. The existence of the pericardium is as general as that of the heart; its nature and disposition are so nearly alike in all animals, that it is not worth while to notice the modifications.

Of the Heart.—In the different orders of reptiles, the heart is found to vary in some parts of its structure; there is, however, no essential difference, when viewed in relation to its functions. The three first orders have a heart consisting of two auricles and a single ventricle, which is sometimes divided into many cavities, communicating with each other. On the other hand, in the batracians there is but a single auricle and ventricle, with its cavity of a simple form. We shall enumerate successively the differences of structure in the four orders of this class of animals.

First in the chelonians. In the animals composing this order, the heart has a form altogether peculiar. The length of the organ is much exceeded by its breadth; in some instances, it resembles the segment of a sphere; in others, it is of a figure but elongated form, and curved in the longitudinal direction. In its natural situation, it is found beneath the lungs, in front of the liver, and partly between the two lobes of the latter. The pericardium, which is capsacious and strong, is in contact with the membrane investing those organs, and is as firmly adherent to it as the pericardium is to the diaphragm in man.

The magnitude of the two auricles is much greater in proportion, than in any animals of the classes of mammalia or birds; the capacity of each is at least equal to that of the ventricle; they are situated in part above the latter, projecting upon its lateral and anterior parts. They possess, somewhat of a rounded form, are without any appendix, and have their parietes thin, with some fleshly fasiculi in their structure. The right auricle, which exceeds in a trifling degree the size of the left, receives, by a single opening at its upper part, the blood returning from the body. Two valves are placed around the borders of the opening, giving it the appearance of a simple fissure. The pulmonary veins alone terminate in the opposite auricle; their termination is provided in the same manner with two valves. A simple membranous partition separates the cavities of the two auricles and their openings into the ventricle. It is on the ventricle that depends the form which we have described as belonging to the heart. Its cavity is very small in comparison to its fives, which is owing to the great thickness of the parietes. These are found to be compacted exteriorly of a moderately thick layer of fibres, which have a direction parallel to the external surface of the ventricle. Beneath these, there are other numerous muscular fasciculi, varying in their direction, but proceeding principally from the superior to the inferior surface; the greater number of them are only contiguous, or separated from each other, allowing the blood to pass through the intervals formed between them as through a sponge. It results from this structure, that the cavity of the ventricle is diminished to one-third of its volume; it occupies the middle and right side of its base. In its greater part, it is lined by a continuation of the membranous fold which covers the auricular orifices, performing to them the office of a valve; it is of a square form, attached at the middle of its external surface to the partition between the auricles, and by its superior and inferior sides to the corresponding parietes of the ventricle; it is only loose and unconnected in its right and left borders. The first is extended over the opening of the auricle on the same side, and the latter over that of the opposite auricle; so that these openings appear in the ventricle separated by the breadth of the fold, while in the auricles there is but the thin septum intervening between them. The blood returning from the lungs into the left auricle is directed into the ventricle by means of the valve belonging to the former, in a course directly contrary to that leading to the opening belonging to the arteries of the body. It must, therefore, necessarily pass through the whole cavity of the ventricle, from the left to the right, and
and into the intervals of the muscular fasciculi composing the parietes. From this structure it results, that there must be an admixture in the ventricle between the blood returning from the lungs, and that portion which has not been submitted to the influence of the surrounding element in its passage through those organs. The opening between the right auricle and the cavity of the ventricle is in a situation directly directed towards the two cavities leading to the pulmonary arteries and arteries of the body; they are both situated completely to the right, in the cavity of the ventricle. The right, which is not always of the same magnitude, is placed inferiorly to the other, having a wide communication with it. In some instances the opening is extended very far towards the posterior part of the heart; in others it is so small, as in the land tortoises, that it does not exceed the diameter of the cavity leading to it. It is only in the first conformation, of which we find examples in many of the sea tortoises, that the appellation of pulmonary cavity can be applied to it. The blood arriving from the right auricle pursues a direction more particularly towards that part, by a channel leading from the one to the other. There is but one opening leading from the pulmonary cavity, which is that of the pulmonary artery; it is provided with two valves, and penetrates the base of the heart more inwardly than the openings to be next mentioned. These are the terminations of the two aorta, which are found near to each other on the right side of the superior cavity, the same which receives the blood of the two auricles. The termination of the left aorta is situated a little more inwardly than that of the right, and inferiorly to it. They are each provided with two semicircular valves. This is the structure found in the sea tortoise; but in the land species the arteries of the body arise by a single opening from the ventricle. The heart of the turtle is best delineated by Mery, in the Acad. des Sciences, 1705.

In the second order of reptiles, the saurians, we shall commence with a description of the heart of the crocodile, which presents an example of the most complicated structure that we have found in the animals of this order, or even in the whole class of reptiles. Its pericardium is found, as in the chelonia, adhering to the peritoneum involving the convex surface of the liver. The apex of the heart is connected by a very strong tendinous chord to the loose part of that bag, which is extremely thick, and has a fibrous structure externally. In its natural situation the organ is found occupying the space between the two lobes of the liver and the lungs on each side. The size of the auricles is somewhat less than in the chelonia; in other respects they are similar. The parietes are strengthened by the fibrous fasciculi proceeding in different directions. The ventricle presents an oval form, and has its parietes of great thickness. Its cavity is divided into three compartiments, communicating by numerous openings. One of these divisions is situated inferiorly and to the right. The auricle of the same side projects into its anterior part the blood received from the veins of the body by a wide opening, which is provided with two valves. The termination of the left descending aorta is found in the same cavity, in its left and anterior side. Behind this latter opening is seen an orifice, which leads into the smallest of the three divisions, at the middle of the base of the heart, and in which is found the common trunk of the pulmonary arteries. It results from this conformation, that there are two channels offered to the blood which has passed from the right auricle into the cavity of the same side; the one by the left descending aorta; the other into the cavity leading to the pulmonary artery. It may even take a third route, and pass through the numerous holes which penetrate the partition separating the superior and left cavities. The left auricle projects into the latter the blood received from the pulmonary veins. A membranous valve is found attached to the border of the opening on its right side. The trunk common to the right descending aorta, carotids, and axillary arteries, is situated to the right of the valve. The blood must either pass into the arterial trunk, and from thence be distributed to the head and extremities, or penetrate into the intervals between the fibrous fasciculi of that cavity, and from thence into the two others. It results from this structure, that the blood distributed to the anterior parts by the carotids and axillary arteries, to the posterior parts by the iliacs, and to the tail by the middle facial artery, is nearly all derived immediately from the lungs, whilst a portion of that which is distributed to the other viscera by the left aorta comes from the right cavity and from the auricle of the same side, and consequently has not been modified by its passage through those organs. The pulmonary blood is not intimately mixed with that from the body, as in the chelonia. Such is the structure of the heart in the crocodile of the Nile, and the caiman or American alligator. For a view of the crocodile's heart, see Cuvier Lesons, t. 5. pl. 45.

It is less complicated in the common iguana (iguana delicatissima). In this animal, the situation of the heart is very remote from the liver, beneath the origin of the lungs, and in the most projecting part of the chest. It is of a conical form, being very broad at its base, and acute at its summit. The auricles present nothing remarkable. In the ventricle, there are but two cavities, the one situated to the right, which forms the proper cavity of the ventricle, the other to the left and superiorly, appearing as a sinus of the former. The openings of the pulmonary auricle and right descending aorta are found in the latter, nearly in the same manner as in the crocodiles. The opening of the right auricle is situated towards the middle of the great cavity or that of the ventricle, and is provided with a very large and muscular valve, in the same way as that of the left auricle. The orifices of the pulmonary artery and left descending aorta are placed lower down in the same cavity; the right on the left, the other on the right. There is no pulmonary cavity. The interior of the ventricle is furnished with fasciculi of very thick fibres.

The structure of the heart in the third order of reptiles, the opisthodons, differs but in a trifling degree from that of the saurians, poising the most simple conformation of this organ. There is no distinct pulmonary cavity. The auricles are of considerable size; that which receives the blood from the body is the largest. Their parietes are thin and transparent in the intervals between the fibrous fasciculi, by which their strength is augmented, and which are irregularly interlaced together. Their cavities are separated by a membranous partition. The figure of the ventricle is generally that of an elongated cone, irregularly formed in consequence of an appendix of the same figure, which projects from the left side beyond its base. The interior is divided into two cavities, the one superior, the other inferior, the former being extended into the appendix. An imperfect septum intervenes between them, having a loose unconnected edge on its right side, and is extended horizontally from the base to the apex; it is composed of fibrous fasciculi, allowing the blood to penetrate in their intervals. A considerable opening, by which the two cavities communicate, is found towards the right side of the base of the ventricle, at the part where the septum terminates. The parietes of the ventricle, of themselves moderately thick, afford attachment to a multitude of fibrous fasciculi, giving additional
additional strength, but greatly diminishing the cavity of
the ventricle. These fasciculi are mostly separate from each
other, allowing the blood to permeate between them as
through a sieve; thus effecting the more perfect admixture
between the portion arriving from the lungs and that from
the body. The openings of the auricles are found close to
each other, at the middle of the base of the heart, above
the septum. The orifice is closed by a semicircular valve
of a membranous structure, the loose edge of which corre-
sponds to the auricle of the same side. The termination of
the arteries is found in the right side of the base of the
organ; that belonging to the pulmonary artery is situated
towards the left and in the lower part, corresponding to
the inferior cavity. On the left of the latter is the opening
of the left aorta, corresponding to the same cavity, and
placed opposite to the opening which forms the com-
munication between the superior and inferior cavity. The
opening of the right aorta is found immediately behind the
left, and corresponds more particularly to the superior
cavity, in which is received both the blood from the lungs
and that from the body; the two portions united are pro-
jected partly into the right aorta and partly into the in-
nferior cavity, and from thence into the left aorta and
pulmonary artery.

In the fourth order of reptiles, the batrachians, the heart
presents a structure the least complicated of the whole clas-
s. It consists of a single auricle of a rounded figure, broader
than the base of the organ, with its parietes strengthened
by firmly fasciculi. At the base of the auricle is the orifice
of communication with the ventricle, which is single, having
a single cavity, with firmly columns, not separated from
each other. At its base is found the common trunk of the
arteries, arizing by a single orifice, situate more to the right
and lower down in the ventricles than the opening of the
auricles. The heart of the frog has been delineated by
Wammerdam, Bibl. Natur. tab. 49; and by Roefel, Histor.
Kanar.

Of the Blood-Vessels. —The distribution of the blood-vessels
in the four orders of reptiles is varied according to the struc-
ture of the heart, and many other circumstances in their
organization. In the batrachians the arrangement differs in
the greatest degree from that of mammalia and birds. All
the arteries arise by a single trunk; consequently there is
but one opening in the heart. In the three other orders,
there are at least two openings, frequently three, which
give origin to as many distinct trunks, one of which is
defined exclusively to the lungs.

Of the Arteries in the Chelonians. —The arteries of the
body arise from the heart by a single or double trunk in
different species; those of the lungs by a single trunk.
They are firmly connected together for a short distance from
their origin. The trunk of the pulmonary artery arises on
the left, lower down than that of the body. It quickly
separates into two branches, one of which proceeding to the
right lung, turns from the left to the right, then advances
forwards to arrive at the anterior part of the organ, where
the infection of the bronchus takes place. The other pro-
ceeds in a contrary direction, palling across the oesophagus,
it arrives at the summit of the left lung.

The trunk of the arteries of the body takes its origin at
the right extremity of the base of the heart, and divides al-
most immediately into two large branches, the right and
left posterior aorta. When the trunk is double at its or-
igin, they separate, forming these two branches. The right
aorta furnishes, near its origin, another considerable artery,
which may be denominated the anterior aorta. This soon
divides into two branches, each of which is again subdivided
into two others, the internal of which, the smallest, is the
carotid, and the external, the subclavian or axillary
artery. The common carotid proceeds by the side of the
neck, concealed by the muscles going to the os hyoides,
leading branches to the oesophagus and adjacent muscles.
It arrives at the head, to the parts of which it is ultimately
distributed, without dividing previously into two principal
branches analogous to the carotids of mammalia. The sub-
clavian or axillary artery furnishes nearly the same branches
as the arteries bearing the name in mammalia, with
the exception that there is no branch corresponding to
the inferior thyroid. The continuation of the trunk forms
the brachial artery. The two posterior aortæ proceed on
each side upwards and outwards; then bending backwards,
they approximate again, and are connected by a communicat-
ing branch, which the left aorta gives to the right; nearly
opposite to the fifth dorsal vertebra.

The right aorta, previously to communicating with the
left, furnishes many arteries to the back or upper shell,
corresponding to the intercostals. The left aorta furnishes
considerable arteries to theificea of the abdomen, which
confume great part of its blood. When the trunk arrives
beyond the cardia, it divides into three branches; the first,
which is the smallest, furnishes a branch to the oesophagus,
and then is distributed to the oesophagus. It is analogous
to the coronary aorta of mammalia. The second, almost
as considerable as the trunk from which it proceeds, distrib-
utes arteries to the intestines, spleen, pancreas, and liver,
in the following manner. The hepatic artery is the first
given off on the right side; it turns backwards and down-
wards to arrive at the liver, and divides into two branches,
and to the base of the vena cava, from one of which proceeds
a small branch to the pancreas, and numerous others to the
duodenum. The third branch is one of small size, and is
distributed to the second turn which the colon makes to the
right. It is the colica dextra. The third branch passes
from the right to the left, and distributes its branches to
the transverse colon. It is the colica media. After having
given off these branches, the trunk pursues a short course
between the layers of the peritoneum, in a direction down-
wards and backwards. It then distributes the following
branches. The pancreatic, which passes from behind for-
wards upon the left border of the pancreas. The spleenic,
a very small artery, distributed exclusively to the spleen.
A very considerable branch, belonging to all the right part
of the colon and cecum. It is a second colica dextra. A
small artery, which, after having given a branch to the
cecum, proceeds to anastomose with the next, the proper
mefenteric artery, which is larger than any of the proceed-
ing, and ramifies in the mefenter of the small intestine,
to which it is ultimately distributed. Lastly, the third branch,
resulting from the division of the posterior left aorta, the
second in magnitude, proceeds obliquely to the right and
backwards, and anastomosing, as has been mentioned, with
the right aorta, without furnishing any branch. The com-
mon trunk, formed by their union, appears rather as a con-
tinuation of the right aorta; it extends along the vertebral
column to the pelvis, giving off the following branches in
its course. Five or six small branches on each side, corre-
sponding to the intercostal or lumbar arteries. The sper-
maties. One or two branches on each side to the kidneys.
A small artery corresponding to the posterior mefenteric,
which is distributed to the cloaca.

The common posterior aortic trunk terminates by four
branches, in the individuals belonging to the teftudo græca,
which we have defcribed. The first on the left was the ex-
ternal iliac of that side, then came the internal iliac of the
fame
fate side, and opposite to it the primitive iliac of the right side. Between the two latter arose the artery of the tail, corresponding to the middle facial artery. The branches of the internal iliacs are very analogous to the same arteries in mammalia. The trunk divides into two branches; one sending branches to the bladder and cloaca; the other dipping into the pelvis, and corresponding to the iliac and posterior iliac arteries. The external iliac proceeds forwards upon the border of the pelvis, furnishes an analogous branch to the epigastic, from which arises the anterior iliac. The first descends upon the internal and inferior piares of the upper shell, and passe in a direction from behind, forwards. A second branch, which arises from the external iliac, opposite to the epigastric, descends along the anterior border of the pelvis, as far as the symphysis of the pubis, and is lost in the muscles of that part. After having furnished these two arteries, the external iliac passes out of the pelvis, takes the name of crural artery, giving off first the circumflex arteries, then the profunda, and in the rest of its course is analogous to what it is found in mammalia.

The distribution of the principal arterial trunks in the saurians differs but little from that which has been described in the preceding orders.

In the crocodile there are three arterial trunks, each having a distinct opening in the ventricle, provided with two semi-lunar valves. The pulmonary artery, which arises from the cavity bearing the name is, situate to the left, and somewhat inferiorly; the posterior left aorta, which arises from the right and inferior cavity, and is situate between the pulmonary trunk and the next to be mentioned; the posterior right aorta, corresponding to the superior cavity. These three trunks are connected together for a short distance from their origin. From the latter proceed, in the first place, the trunk common to the subclavian and left carotid, which remains attached for some extent to the posterior left aorta, then advances obliquely forwards, pales beneath the bronchus, and divides beyond that canal. Secondly, a similar trunk for the same arteries on the right side. The posterior aorta, after having give off these branches, takes in a direction, first from below upwards, then from before backwards, and divides in a direction obliquely inwards beneath the spinal column, without furnishing any remarkable branch until it receives the communicating branch from the left aorta. This latter turns around the bronchus on its own side, and pales backwards and inwards in the same way as the preceding. After having palled the cardia, it divides into many branches, which proceed to the stomach, spleen, pancreas, and duodenum. These receive the greatest part of the blood of the trunk. The latter has no communication with the right aorta, but by an artery, the diameter of which is scarcely equal to a fourth part of the trunk from which it proceeds.

We have already alluded to the consequences resulting from this arrangement of the arteries, in the description of the heart. All the other arteries derived ordinarily from the abdominal aorta, with the exception of the celiac trunk, here take their origin from the right posterior aorta. It is remarkable that the anterior mesenteric takes its origin at a very considerable distance from the celiac trunk, or from the arteries ordinarily composing it; while, in the cheloniens, it most frequently arises very near, or is even a branch derived from it. The splenic is also given off by the celiac. After having passed through the substance of the spleen, from its anterior to its posterior part, and distributed to its substance many small branches which arise at a right angle from the trunk, it pales out almost as large as at its entrance, and proceeds to be distributed to the rec-
orbicular gland, placed in front of the base of the heart, likewise to another gland of a more considerable fize and elongated form, situated beneath the jugular. The trunk then furnishes the common carotid, the only one existing in this order of reptiles. It passes obliquely to the left, and advances, by the side of the left jugular, between the trachea and the oesophagus, and lastly beneath the latter. It sends a great number of ramifications to these organs, and divides near the head into many branches distributed to the adjacent parts. Near to the vertebral column, the right aorta produces a considerable branch corresponding to the vertebrae and superior intercostals which proceeds along the spine, fending to it branches, and wholly penetrating into it near the head. When the communication takes place between the right and left aorta, the diameter of the former is become very small, so that the greatest part of the blood which it has received from the heart is distributed to the parts in front of that viscera; it is properly the anterior aorta. The left aorta ascends and turns backwards to the left, passes beneath the aortic arch; then by the side of and always beneath the lung, receiving the right aorta beyond the heart; and continuing to pass in a direction backwards, it gives off branches corresponding to the intercostals, likewise arteries to the vifeera. Those branches proceeding to the stomach, pulmonary bladder, and liver, are detached successively from the aorta, as it proceeds backwards; thus there is no caudal trunk. Nearly opposite to the pylorus, the aorta furnishes the anterior menenteric, which proceeds parallel to the intestinal canal one half of its extent, sending to it branches. Farther backwards the intestinal canal receives three other small branches in succession, from the same artery: as it passes backwards, it also sends similar branches to the kidneys, ovaries, &c.; arrived at the lower part of the abdomen, it penetrates beneath the venter of the tail and is lost in that part.

In the left order of reptiles, the Batracians, the aorta, which proceeds from the base of the ventricle, soon divides into two branches, which separate and pursue a very oblique direction from within, outward, and a little forwards. Each branch gives off a pulmonary artery, a common carotid, an axillary, a vertebral, and arteries corresponding to the intercostals; then turning backwards, and approaching its fellow, it speedily becomes united to it. The trunk formed by their junction gives off, first, the celiac trunk, then all the other arteries which arise ordinarily from the abdominal aorta, presenting nothing worthy of remark.

Of the Veins.—In the Chelonians there are two posterior vena cave, which pass through the liver, on each side, and receive in their course numerous small hepatic veins. Immediately after their exit from the liver, they are joined by two anterior vena cave, one on each side, or by the common trunk of the jugular and subclavian. They all terminate in the right auricle by an opening in the form of a sillage, provided with two valves; they do not terminate in the cavity of the auricle, but in a receptacle communicating with it. The pulmonary veins united in a single trunk terminate in an analogous receptacle, which opens into the left auricle; around the borders of the opening, there is placed a fleshy valve in the form of a half moon.

In the Saurians and Ophidian, there is but one posterior vena cave, and two anterior, that belonging to the left side passes across, and above the heart, in a direction from left to right, and terminates in the common receptacle by the side of the posterior vena cave. This receptacle, similar to that found in the chelonians, has in the same manner its entrance into the right auricle, in the form of a sillage, and provided with two valves. In this order, likewise, the anterior venæ cave are more properly considered as the jugulars. They have also a double azygos, one formed by the intercostal veins in front of the heart, the other posterior to it. They both join the right auricle by the side of the right jugular. It appears that they are rendered necessary by the situation of the venæ cave, which is very remote from the vertebral column, and more inferiorly.

The pulmonary veins in the faurians are similar to those of the chelonians.

In the ophidian order there is only one, which terminates in the same manner in the left auricle. Its volume exceeds that of the artery, which we have not observed in the other reptiles.

In the batracians the veins have a distribution similar to that of the arteries which results from their terminating in a single auricle, in the same way as the latter arise from a single ventricle. There are two anterior venæ cave which receive the blood from the head, neck, anterior extremities, and from the veins analogous to the external mammary, which are very considerable, extending beneath the skin to the groins, and likewise a posterior vena cave, which receives the veins from the other parts, presenting nothing worthy of observation.

The blood-vessels of the tadpole are described in the account of that creature in the division concerning the generative functions; and those of the proteus and firen, in the separate description of those animals at the end of this article.

Physiology of the Circulating Organs.—The nature of the blood in reptiles, the points in which it differs from the corresponding fluid in other classes, its difference in the various orders and genera, its relations to the food and to the secretions and excretions, are so many interesting topics of inquiry, on which we have absolutely no information to offer. Chemistry does not yet appear to be sufficiently advanced for the successful investigation of these and similar matters.

We may observe, in the first place, that the reptiles of these climates at least, possess, in comparison with warm-blooded animals, a much smaller quantity of blood in proportion to their size: hence their muscles are whiter, and some of their viseera, particularly the lungs, which are loaded and gorged with such a profusion of blood in the warm animals, present in this respect an appearance altogether contrary in reptiles.

"I made an experiment," says Blumenbach, "on the water salamander, (lacerta laucophila, L.) of which I dissected twenty-four, adult, lively, recently taken in the early spring, and weighing together 1/2 ounces, in order to measure the quantity of blood they contained: I could preserve from the whole of the bodies of all, only two feet and a half. This small quantity of blood is to the whole body as 1/8 to 1/4; while in an adult and healthy man the proportions are calculated at 1 to 5. Haffelquint observed the same circumstance of the small quantity of blood in proportion to the body, in the crocodile of the Nile." Voyeur dans le Levant & en Palestine.

It is also remarkable, that the arterial blood of our reptiles differs in external appearance in the smallest degree, if at all, from the venous, so that one can be distinguished from the other only by the situation and colour of the vessels; while, on the contrary, the bright scarlet arterial blood of the mammalia offers so remarkable a contrast to the dark livid or purple venous fluid; unless when they have been for some time in a warm bath or other warm medium, when it appears from the elegant experiments of Dr. Crawford,
ford, that the venous blood, becoming gradually less and less dark coloured, approaches more nearly to the vivid redness of the arterial stream. (See Philos. Transact. v. 71. p. 487.) Haller observed that there is no difference between the arterial and venous blood in the frog. (Oper. minor. v. 1. p. 183.) And Spallanzani noticed the same fact in the lamander or water newt: "avuta egualità di diametro, il colore del sangue veno e somigliantissimo al colore del sangue arterioso." De' fenomeni della circolazione, pag. 106. And again, "il sangue arterioso in nulla differisce dal veno, sia nel colore, sia nella densità." P. 193.

In this circumstance reptiles resemble the fuscus of warm-blooded animals; in which, so long as it remains imured in its uterine bath, we know that the arterial and venous bloods are of the same colour.

Yet all animals of this class are not alike in this respect. Accurate observers have asserted, that in the tortoise the venous blood is black, and the arterial crimson, as in the warm-blooded classes. (Caldefi, Osservazioni Anatomiche intorno alle Tartarughe, p. 60. Mery, Hist. de l'Acad. des Sci. de Paris, 1669. v. 2. p. 210.) This difference probably corresponds with the diversity of structure observable in the respiratory organs, which are calculated, in the different orders of reptiles, to admit of a more or less intimate exposure of the blood to the air in respiration.

The colour of the blood varies in our amphibia according to the state of their nutritive functions: it is paler when they have failed, of a deeper red when they have been well fed. If, under the latter circumstance, it be drawn from a vein, and exposed to the air, it exhibits a bright florid redness as it forms the coagulum.

The component elements of the blood of amphibia, considered in a general way, seem nearly to resemble those of the warm-blooded animals, except that in the former, when examined alive, there are almost always seen bubbles of air mixed with their purple fluid, performing, like the blood itself, the circulation, and dividing that fluid in the vessels into intervals, as the mercury is interrupted in a badly made thermometer. Redi and Perraut observed this fact in tortoises; Jacobuzzi in serpents; Daudin in the green lizard, frog, and lamander (Hist. Nat. of the Reptiles, Introd. p. 184.); and Blumenbach in the amphibia of Germany. Now, although in certain states the veins may be very turgid, and elastic air may be found in them after death, nothing of this kind is ever known to take place in a healthy and strong individual. The air indeed is supposed in the mammalia to constitute one-thirtieth of the blood, but it is so dissolved, and so intimately mixed in the vital stream, that it can only be extracted and exhibited in its elastic aerial form by artificial means.

The phenomena of the circulation are common on the whole to the reptiles with the warm-blooded animals, and are very familiar in the former, since the wonderful circulation of the bowels was not only first actually seen and described in frogs by the great Malpighi, but is also still examined to the present time in these animals. The branchies of the tadpole are very favourable objects for investigations of this kind.

As the circulation can be actually seen in these animals, we may inquire on this subject, whether the globules of the blood, entering the minute vessels, can be really observed to change their figure, and become oval instead of sphericall. 1. In warm-blooded animals," says Blumenbach, "I have never heard or read that any one has seen such a change; and I certainly have never seen, either in the incubated chick, in which the circulation of warm blood may be most clearly and beautifully observed, particularly on the fifth and following days, or in the frog or lizard, any oval globules: yet Reichel affirms that he has seen globules changed from sphericall to oval in the menstrency of the frog, and has given an elegant plate in illustration of the fact. See Experienta de Sanguine ejusque motu, fig. 3." Blumenbach. Specimen Phytiol. p. 10. He doubts, however, whether this change can be considered as a natural occurrence in the healthy circulation, or ought to be referred to the disturbance naturally following the sufferings of the animal.

The motions of the heart, confiling in our amphibia of a single auricle and ventricle, agree in the alternate contractions and relaxations of those parts, with the analogous succession of systolic and diastolic changes observable in the double auricles and ventricles of the warm-blooded classes.

A question was formerly raised, concerning this systole or contraction, whether the ventricles are really shortened, or experience merely a diminution of diameter? The former, says Blumenbach, has now been proved by the most careful observations both in cold and warm-blooded animals; he adds, that he has never seen it demonstrated more clearly, and he believes, as from the perfect accuracy of his work, than in the common fuscus (coluber natrix), in (specimens of which, two yards long, from the woods of Germany, he has observed, and frequently demonstrated, a shortening of the ventricle equal to two lines. Blumenbach states further, that the ventricle is completely emptied in its systole, not the least drop of blood flowing back into it from the aorta, in the snake, frog, and toad, and also in the incubated chicken. But he does not venture to decide, whether the fame thing occurs in man and the other mammalia, or whether the semilunar valves may intercept some drops of blood, which thus are made to flow back into the ventricle.

Reproduction.—As the nutrition and growth of parts, in the healthy state, are among the most important functions of the blood-veffels, so the repair of injury, and the restoration of what is mutilated, constitute another very striking instance of their powers, and a very impressive example of those prerogatives, which belong exclusively to living organized beings. Although this power of reproduction, taken in its most extensive acceptation, cannot be said to be withheld entirely from any animal, several genera of reptiles possess it in a more remarkable degree than any of the other vertebral classes. There is an interesting account in the Memoirs de l'Acad. des Sciences de Paris, 1686, particularly of the restoration of the tail of lizards. Spallanzani, Bonnet, and Blumenbach, have employed themselves in researches on this subject. The former first called the attention of the public to it in his "Prodromo di un' Opera da imprimeri sopra le Riproduzioni Animali." Bonnet published his memoir on the reproduction of the limbs of the water newt in the Journal de Physique, 1777. His enquiries were again published in his "Œuvres d'Histoire Naturelle," t. 5, and there are three memoirs by him on the subject, translated into English, in Spallanzani's "Tracts on the Natural History of Animals and Vegetables," v. ii. The experiments of Blumenbach are contained in his "Specimen Physiologize comparatī." The experiments have been made chiefly with the water newt; on the lacerta agilis of the terrestrial kind, see P. T. Hartmann, dubia de genera-}
hand and the right foot off a large newt; and a stream of blood, as thick as a hog’s bristle, continued spouting out nearly two minutes without intermission. Not only did the animal seem not in the least enfeebled by the loss of blood, but, in scarcely a quarter of an hour, to my great surprise, it swallowed two earth-worms.” (P. 393.) “When the tails of large newts were amputated near their origin, the whole died in a certain time. If the part be cut off about its middle, reproduction will follow. A tail was cut on the 11th of July, and on the 14th of August, the reproduced part was about three lines and a half long, and four and a half in diameter at the base. The new portion was ten lines in length on the 20th of September, and shaped exactly like the tail of a newt. I could observe no difference between the motions of this regenerated tail, and those of tails unamputated. On the 5th of October the regenerated part had a peculiar transparency, wanting in the rest of the tail.” P. 381, et seq.

“‘The fingers and toes are not evolved in the same proportion as the arm and leg. Now, when I write this, on the 16th of October, the new arm and leg of the newt, mutilated on the 6th of June, have nearly attained the size of the original members, while the regenerated fingers and toes have not acquired half their natural size; yet they are perfectly well formed, and execute all their functions.’ P. 390.

Blumenbach found that the true salamander (lacerta famamandra) possesses the same reproductive power as the water newt (lacerta fusca): that a third part of the tail, or a toe, would be perfectly but very slowly reproduced, and remained even at the end of a year considerably inferior in size to that of the original parts. Specimen p. 32.

Bonnet made other experiments to determine whether reproduced members possessed the same powers of reproduction as those amputated. He cut off an arm and a thigh of a large newt on the 2d of June; as soon as the hand and foot were visible, he cut them off, and they were renewed; he repeated this four times, the last operation being on the 13th of October, and the parts were each time restored. P. 394, et seq.

He dislocated the arms of one and the thighs of another newt, so that the members immediately after were pendent, as if dead, the animal having no power over them. On the following evening each newt moved the dislocated limbs with a liberty and facility which announced that nature had already repaired the disorder. P. 431.

The most surprising fact in Bonnet’s Memoir is the reproduction of the entire eye. “With a scalpel,” says he, “I extracted the right eye of a large newt on the 13th of September, 1779; but I did not obtain the globe without much injury to the tunics. A deep bloody wound in the socket of the eye was the consequence of this cruel operation. And the reader will not be surprised if I hardly expected anything from it, and that the newt would probably remain blind for ever. How great was my astonishment, therefore, when, on the 31st of May, 1780, I saw a new eye formed by nature. The iris and cornea were already well shaped, but the latter wanted its peculiar transparency, which is very considerable in these animals. The refraction was complete on the 1st of September; the cornea being transparent, and the iris having acquired its yellow gilded colour. On the 8th of November 1780, it differed from the other eye only in being a little smaller, and in the iris, or golden circle, going only half round the ball.” P. 432, et seq.

“I repeated,” says Blumenbach, “the experiments of the celebrated Bonnet, concerning the reproduction of the eye in the water newt. I cut out the whole globe, at the insertion of the optic nerve, in three instances, in neither of which was the organ reproduced; but a white and firm fungus, shooting from the cut end of the nerve, gradually filled the orbit; the animals themselves becoming infected with a kind of dropical swelling, and dying in few
few months. Instructed by these failures, I proceeded to operate in a different way on a fourth animal, in May 1784. I first divided the cornea, to let out the lens and other humours, and then cut away the remaining empty and collapsed coats, leaving a small portion of the common coverings of the bulb, which, from a careful examination in water with a glafs of the parts removed, I judge to have been scarcely equal to one-fifth of the whole globe. In the following months the whole orbit seemed closed by the approximated eye-lids, which, however, began to separate in the sixth month after the operation, and thus disclosed a new little bulb springing up from the bottom of the orbit. This new globe was still much smaller than the other in April 1785, when the animal died accidentally, though in other respects it was most perfect, exhibiting the golden iris with its regular pupilar aperture behind the cornea, all which points are clearly distinguishable in the preparation which I prefer. Specimen, p. 37.

"On comparing," says the author last quoted, "the facts just detailed with the very limited and much less perfect reproduction observable in warm-blooded animals, we shall become sensible of the wide difference between them and the amphibia. I am daily more and more convinced, that no parts are reproduced in man and the other mammals, except such as are composed merely of cellular substance, and enjoy no other kind of vital power except common contractility; and I cannot find sufficient proof that the irritable muscular fibre, the sentient nervous medulla, or those parenchymatous which are endowed with a peculiar modification of vitality, have ever been truly reproduced in a warm-blooded animal." Ibid., p. 32.

Tenacity of Life.—This subject is so far analogous to that which we have just considered, that we pass naturally from the view of the facts, in which the surprising reproductive powers of the class is evidenced, to the no less astonishing examples of their very hardy vitality; of the energy and permanence of their vital forces, both in individual parts, and in the body at large.

The amputated tails of water newts, and the divided fragments of the blind-worm (anguis fragilis), exhibit very lively motions for ten hours and more. The heart of a frog or serpent continues to palpitate on irritation many hours after its separation from the body; and the limbs of frogs are excitable by the Galvánic influence for a long time. Some reptiles, as the serpents and teftudines, can open and shut the mouth long after the head has been severed from the trunk. General Gage informed Blumenbach that he had seen the amputated head of a rattlesnake bite long after its separation; and another British officer told him that when he put a flike between the jaws of an American turtle, the second day after decapitation, it was firmly held.

The same energy of the vital force in the parts, and the independence of one class of functions on another, in the amphibia, are further evinced by many well known facts; the limbs of turtles have moved for fourteen days, nay, on the thirteenth day after decapitation (Güldenstädt, Theoria virium corpor. hum. primitivum, p. 74.); and a rattle-snake lived some days after the skin had been removed, and most of the vifera taken away. Tyfon, in Philosophical Transactions, No 144.

In the beginning of November, Redi opened the skull of a land tortoise, and removed the whole brain. The animal did not seem to suffer, it moved about as before, but groping its way; for the eyes soon shut after losing the brain, and never opened again, a feathery integument formed, which covered the opening of the skull, and in this state the animal lived till May. Spallanzani deprived four frogs of the brain; two lived till the fifth day. He also deprived three newts of the brain; they suffered violent convulsions; their eyes closed, they hardly moved from one place to another; and expired about the middle of the third day. He cut the heart out of three newts; they took to flight, leapt, swam, and executed the same functions as before; however, all died in forty-eight hours. Four frogs, deprived of the heart, kept their eyes open, and preferred the use of their limbs. They surved thirty-six hours. Spallanzani's Traicts, Introduction, p. 45.

Captain Cook met with a turtle, in which there was a wooden harpoon about fifteen inches long, and barbed, between the shoulders. The opening by which it had entered was quite healed.

Redi and Boyle saw some signs of life in serpents after they had been twenty-four hours in vacuo. And they will live more than four hours in spirits of wine. See Daudin, v. 6. p. 100; and v. 1. p. 270.

In our account of the physiology of the digestive organs, we have already noticed the singular power which reptiles possess of remaining for such long periods without food. They are equally remarkable for being able to bear, permanently, considerahle degrees of heat and cold. Not only are most of the Clafs inhabitants of the warmest regions, but some of them, like some fishes, are known to live in warm springs, inhabiting them spontaneously, and appearing to be healthy. (See Coccii in Spallanzani, Opuscoli di fisica animale e vegetabile, v. 1. p. 46.) They live in the warm springs of Pisa, which rife to 37° of Reamur, 115° of Fahr.

"Besides a host of suspicious narratives," says Blumenbach, "of newts, and other amphibia, which have lived for a considerable time in the human body, there are many exceptions and incontestable examples of this remarkable phenomenon." See the narrative of Th. Reinéius, a most respectable authority, concerning a girl of Altenburg, in Bartholin, Act. Hvanienf. v. 2. p. 110; Harder, Apior. Observat. p. 89; I. R. Zwinger in Act. Helvet. v. 1. p. 22; Hiit. de l'Acad. des Sciences de Berlin, 1770, p. 40; a map of citations in Jacobus de ranis et lacertis, p. 12; Paulini de Bufone, p. 38; I. Helwig Observ. p. 249 and 272; Kundmann Promptuarium, p. 108; also Act. Natur. Curiosi; Collectan. Vratislaviensis, et Commerce Literar. Norici. These facts are not so remarkable on account of the degree of heat to which the animal is exposed, as from the other concomitant circumstances. We must observe, however, that these animals inhabited the stomach so long as they continued alive, while the individuals troubled by these unusual guests were, by their suffering, to drink copiously of water, and thus in a manner supplied the newts with their natural element.

"Reptiles have the power of bearing intense cold as well as great heat. I one morning found a tree-frog, which I had kept for some time, in consequence of a froit suddenly set in the preceding night so as to reduce the thermometer to 35° Fahr., completely inclosed in a cake of ice, like insects in amber; of course it was motionless, the eye-lids shut, &c. As the ice melted, the animal recovered, first moving its hind legs, when they were difengaged; the head and trunk still being moist firmly detained; when the solution was complete, the whole animal was reflexed, seemed as well as before, and surived a long time. Du Fay attests the same circumstance concerning water newts; Mém. de l'Acad. des Sciences de Paris, 1729, p. 144. The amphibia are exposed to be frozen in their winter sleep; but we are the less surprised..."
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surprised at the occurrence, because all the functions are either entirely suspended, or most languidly performed." Specimen, p. 10.

Organs of Respiration.— After describing the heart, and viewing the phenomena of the circulation, we proceed to the lungs, which are not only most important parts in the economy of all animals that possest blood, but constituting, in the peculiarity of their structure and functions, the most striking marks of distinction between reptiles and warm-blooded animals.

All reptiles breathe by means of lungs, which in their bulk considerably exceed those of the mammalia, while the latter are as far inferior in the abundance of their vascular ramifications, and the wonderful minutenefs of their internal subdivisions. These large, but loose and rare vehicular lungs, are contained, not in a particular cavity, separated from the abdomen by a diaphragm, but, with the other viscera, in a general cavity of the body. Hence the mode of respiration is as different from that of the mammalia, as the texture of the organ.

In the general position, that reptiles breathe by means of lungs, there is an exception in the batracian order; in some of which (the Proteus and firen) there are branchial appendages or gills, as well as lungs; while in the first flat (the tadpole of others), there is a similar conjunction of these two modifications of respiratory apparatus. See the anatomy of the tadpole, in the account of the generative organs, and that of the firen and proteus, at the end of this article.

The Air-tubes.—The trachea is not divided into bronchi in the ophidian order, which have a single lung; neither does this division take place in the green lizard (lacerta agilis), whose trachea, having reached the united anterior extremities of the two lungs, opens into each by a large orifice: but it is found in almost all the other animals of this clas: The division is effected very early in the chelonians, which have consequently a very short trachea, and long bronchi; more particularly because the latter, instead of entering the lungs directly, first make a turn in the chest. The trachea is divided much later in the crocodile, where the tube is bent from behind forwards, divided into bronchi, which also run forwards, and then turn from before backwards, remaining for some time joined to each other. The bronchi are extremely short in most other reptiles: they begin, in the batracians, immediately below the larynx.

Reaching the lungs, the bronchi generally terminate abruptly by one or more large orifices, which open into the cavities of these vicera. This is what occurs in the ophidiæ; but in the chelonians and the crocodile, each bronchus is continued into the interior of its lung, before it terminates. They are continued, in the telludo graeca, into the most remote part of the lung, without undergoing any sensible changes of diameter; and they communicate with the large cells composing these vicera, by ten or twelve wide orifices, of which the outlines are circular, like the commencement of canals. In the turtles, each bronchus penetrates in like manner to the farthest part of the lung, but gradually diminishing in diameter. Their sides are pierced with numerous holes, opening into the pulmonary cells.

The relative size of the trachea and bronchi does not exceed what we observe in the mammalia and birds, except in the ophidiæ, where the diameter of the former is very considerable. These air-tubes never exhibit any inequalities, such as are seen in birds.

They are generally composed of complete cartilaginous rings, and consequently are little suscectible of changes in size. We must, however, except the crocodile, in which animal the front end of the trachea presents, on its upper surface, a membranous interval, which is wider the nearer we come to the larynx; (see Humboldt Recueil d’Observations, &c. tom. i. p. 11. of the crocodile of the Orinoco; and Geoffroy in Annales du Museum, tom. ii. of the Nilotic species); the cameleon, where the annuli are incomplete in the last portion of the trachea, and at its bifurcation; and the ophidiæ, in whom the trachea possest cartilages only in one third of its circumference. These cartilages are also visible for a short space along the front end of the lung, in a groove of its inferior surface, containing also the pulmonary vein. The trachea, however, ceafe suddenly on touching the lung, and dilates immediately to form its fac.

In those reptiles which have bronchi running throughout the length of the lungs, the portion of the tube, contained in the vicera, has only imperfect and irregular pieces of cartilage, which nevertheless surround its circumference. They are more thinly scattered in the turtles, in proportion as we observe them farther back in the lung.

This cartilaginous structure of the air-tubes (the trachea and bronchi) of reptiles, renders them very incapable of changing their diameter. They seem entirely destitute of transverse muscular fibres; nor do we perceive any longitudinal ones to diminish their length. The membranous trachea of the ophidiæ, possest cartilages only in the inferior third of its circumference, seems equally destitute of muscular fibres. On this membrane we discover a fine white and opaque net-work, which is continued into the interior of the lung, where its meshes, as we shall see, border the cells, and are formed of stronger threads, apparently of a tendinous structure, and perhaps capable of contraction.

Vesicular Structure of the Lungs.—We have mentioned that the lungs of reptiles are very large: they are immense in the tephidines and cameleon, and are even considerable in the native amphibia of these climates, if you compare their relative bulk to that which they possest in warm-blooded animals. We have just seen that the bronchi do not divide, that they do not usually enter the lungs, but terminate abruptly by one or more large orifices, as soon as they have reached these vicera. In the batracians and faurians, the lungs form two faces, varying considerably in their form and relative size, and having their internal surface divided by membranous plates into polygonal cells, in which other smaller plates form more minute divisions. They have been julily enough compared by Blumenbach to the reticulated structure, in the second stomach of ruminating animals. These cells are more numerous, smaller, and deeper in the anterior part of the face: they become more open towards the posterior part; and when the latter terminates in one or more appendages, we see only a net-work, with loose and extremely fine meshes. Afterwards the paries of the pulmonary face are quite simple, and without any division. Such is the structure in the appendices which terminate posteriorly the lungs of the cameleon, and the agame or lacerta marmorata; and of the great bladder in which the single lung of the ophidian order ends.

The lungs of the salamander, the proteus, and firen, form also simple faces without any division.

"In frogs and toads," says Blumenbach, "the lungs are made up of polyhedric and large cells: the same structure is observed in the lacerta agilis and salamander. They form an oblong bladder in the aquatic lacerta (water newts). The lung of the coleher natrix forms a single bag of large fize, hollow throughout; and the same structure seems, from the reports of anatomists, to exist in other serpents. (See Coiter Obf. Anat. Chir. p. 126. Charas Nouvelles
The pulmonary artery also as bronchial vessels in reptiles; at least we find no arteries or veins of the latter description. The arterial and venous bloods are mixed in the heart; and the farce that goes to the lungs is conveyed to all other parts of the body for their supply.

Yet the pulmonary are not the only arteries conveying blood to the lungs in reptiles: the serpents, at least, offer an exception. The ramifications of the pulmonary artery are confined to that part of the lung, which has a reticulated internal surface. The posterior part of the organ, encompassing the simple membranous bag, receives blood only from the arteries of the body. A part of the twigs that supply it comes from the branches of the posterior aorta, which are also distributed on the stomach. Other very minute ones are detached successively from the vertebral column. The veins corresponding to these arteries pour their blood into the vena cava. In this singular structure, we find a part of the lung executing the office of the cells of birds: and a portion of the blood, very small indeed, contained in the arteries of the body, is again submitted to the action of the air.

That portion of the general vascular membrane which covers the lung has nothing peculiar in reptiles.

The form and bulk of the organs vary much more in this clafs than in the mammalia and birds. Both are determined in the mammalia by the cavity of the thorax; in birds, by the peritoneal cells, which limit them on one side, and by the ribs, which cover them on the other. In reptiles, on the contrary, nothing seems to limit their development, nor to give them a peculiar figure. Commonly they form oval bags, which extend in the chelonians along the back to the pelvis, above all the vicera; they are lefs extensive in the saurians and batracians. The serpents have a fingle very long lung, prolonged over the esophagus, stomach, and liver, beyond the latter parts. In this situation it is exposed to preflure every time the animal swallows a large prey. Does this check the pulmonary circulation, and contribute to the torpor which serpents experience at these times?

In the cameleon, and the agame marmorata, each pulmonary sac is very extensive. They are divided into large conical appendices, prolonged as far as the pelvis, placed among the vicera, and capable of holding so much air, as to increase the animals’ bulk considerably when they are difposed. The lungs of the firen lacertina are two long cylindrical sacs, continued to the end of the abdominal cavity. In the larve of the falamander, there is a small oval cavity, opening by a narrow canal in the fauces.

Branchia or Gill.—The first orders of reptiles (the chelonians, saurians, and ophidians) never possess this kind of respiratory organ: they have only lungs. The batracians in their first flate, and the serpents and firen during life, have both lungs and branchia, or rather branchial appendages (appendices simbrati). See the anatomy of the tadpole, and that of the serpents and firen, at the end of this article.

Expansive Power of the Lungs.—“A singular power,” says Blumenbach, “characterizes these vicera in reptiles, and...
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is a point, in which they exceed those of the human subject, and of the other mammalia; namely, a particular kind of tone, or energy, by virtue of which, even when the chest is opened, and they are exposed to the external air, they are still distended and support themselves, while those of the mammalia, when the rernum is removed, and the thoracic cavities exposed, allow the air to rush out, and collapse. (See Morgagni Advers. Anat. 5, 29, and the elegant experiments on the tortoise by the Parifian academicians; Hist. des Animaux, part ii. p. 194.) It is even afferted, that when the lung is compressed in a tortoise opened alive, it has the power of diffending itself again. (Cottet Obs. Anat. Chin. p. 127.) A tortoise, from whom the lower shell had been removed, the thorax consequently being opened, and the lungs exposed to the air, survived for seven days. (Hist. des Animaux, just quoted.) The cause of these phenomena can only be found in the peculiar vital properties of the lungs; as it cannot be referred to contracility, irritability, or nervous influence. I have never been able to detect, in the lungs of amphibia, any more appearance of truly muscular texture, than in those of the mammalia, to which a modern author has too liberally affigned irritability. (Vannier in Hist. de la Soc. de Médécine, 1759.) The design of this peculiar vitality in the lungs of amphibia will appear very obvious, when we consider that it exists in animals who have a very imperfect bony thorax, or none at all, or one in great measure incapable of motion. Such is the case with frogs and toads, who are entirely destitute of ribs; with nearly all the tortoises and turtles (excepting, perhaps, a few of the soft species), in whom the whole coverings of the trunk are immoveable, so that neither the thorax, nor the abdominal muscles, can execute those motions in respiration, which they perform in warm-blooded animals.

Mechanism of Respiration.—In this, as well as in other points, the several orders of reptiles differ from each other. The chelonians, whose ribs are in the form of large fleshy plates, consolidated to each other, and motionless, are, in effect, like the batracians, some of which have no ribs at all, while in others these bones are too short, and too little susceptible of motion, to be capable of afflicting in the process of respiration. In all these animals, then, we can no longer regard these bones as the principal agents of the respiratory function. They also want the diaphragm, like all other reptiles. Consequently the mechanism of respiration differs in them, in its essential points, from that described in the article Lungs, which belongs to the whole class of mammalia, where the respiratory organs, included in a peculiar cavity, follow all the motions of that cavity.

In fact, it is now well ascertained, that the batrachian reptiles expel air into their lungs. They close the mouth, and dilate the throat, when the external air, rushing through the nostrils, fills the empty space. The rerno-hyoiodei, carrying the os hyooides downwards and backwards, are the great agents in this dilatation of the throat: the coraco-hyoiodei afflent them. When the former muscles are cut, respiration ceases. The elevation of the os hyooides, principally by the thylo-hyoiodei, contracts the cavity of the throat, and drives the air into the lungs. The escape of this air from the throat by the nose is, no doubt, says Cuvier, prevented by a valve; but no such structure has been demonstrated. The action of the abdominal muscles, and perhaps a contractile power of the lungs themselves, expel the air from these viscera in expiration. Townson, who has investigated this subject most attentively (see his Observations Physiologiques de Respiration Amphibiornum, 8vo. Vienna, 1798, with figures; also translated into English in his "Traité,"') observes, that he does not know whether the muscles extending from the glottis to the tubes should be called oblique or not. They surround the lungs in their whole extent, and have a considerable compressive force. They probably confit of different muscles; their fibres extend more or less transversely, and are therefore well calculated to produce the effect he has assigned to them. He states that he has always seen the frog's lungs collapse when the glottis was opened, whether the animal was dead or alive.

If the muscles and the membrane of the throat are removed, leaving only the rerno-hyoidei, the motions of the os hyooides, which take place in respiration, are continued, although respiration itself is destroyed. The latter effect is a consequence of the destruction of the throat; no cavity can now be formed to receive the air, which the animal swallows in breathing. The os hyooides, however, is alternately depressed and elevated, and the glottis continues to open and shut, but the lungs are permanently collapsed. If all the muscles employed in moving the os hyooides are cut, the glottis, whole muscles are entire, is opened and closed. In the same way, when warm-blooded animals have received a large wound in the chest, they make vain efforts to breathe, and to get rid of the painful sensation of suffocation.

It will appear, from the preceding description, that the frog's mouth must be shut when he breathes: and this is so strictly necessary, that the animal perishes from suffocation, if his mouth be kept open. Herholm and Rafn afforded this in a communication to the Academy of Sciences at Copenhagen, and the point has been verified by Cuvier and Dumeril. See Bulletin de la Société Philomatique, No. 30, an. 7. p. 43.

The same mechanism is employed in the cheloniens. Depression is the only means they can employ for introducing air into their lungs. Having the mouth closed, they alternately contract and dilate the throat, like the batracians, and by the same powers. The air is expelled from the lungs by two pairs of muscles, analogous to the abdominal muscles. These fill the posterior interval between the rernum and the back shell, in which the posterior extremities are folded when at rest. We perceive, at this part, in the cheloniens, those motions of contraction and dilatation, which are observed over the whole abdomen in the mammalia.

The first, or outer pair, correspond to the external oblique muscles: it is attached to the whole anterior edge of the pelvis, to the back and front shell, and is extended in the whole posterior interval of these parts. The internal muscles consist of transverse fibres, attached above to the posterior half of the back shell, near the vertebra, descending on the outside of the viscera, inclosing them, and terminating below in a middle aponeurosis. The latter passes partly under the bladder, and will serve to evacuate that organ when the muscles contract. They comprise immediately only a small portion of the lungs; but they press strongly on the abdominal viscera, and through the latter on the lungs, so as to expel the air. Perhaps, too, the lungs may contract by some powers of their own.

The mechanism of respiration, in the faurians and ophidiens, is very analogous to that of birds, inasmuch as this function is particularly executed by the motions of the ribs and of the abdominal muscles. In most of the faurians, the ribs are perfectly similar to those of birds, consisting of two portions, united by a moveable articulation, and forming an angle, which is opened in inspiration, and closed in expiration. The muscles which put them in motion are analogous to those employed for the same purpose in birds.

The ribs of serpens, forming simple arcs, composed
merely of an osseous portion, are inclined backwards, and brought near the vertebral column in expiration, and are extended in inspiration. Elevators of the ribs, similar to those of man, but larger in proportion, produce the latter effect, in which they are assisted by intercostal muscles. The muscles carrying the ribs backwards, and thus producing expiration, lie within the chest. They are fixed to the sides of the vertebral column, and correspond in number with the ribs. They are narrow and flattened, forming a kind of muscular ribbons, paling from the vertebral column, over one rib, to be fixed in the next. Other muscular ribbons are attached to the inside of the ribs, and to be joined together, and then extend across, ending in a thin aponeurosis, which unites the ribbons of each side. These compose the abdominal muscles, and compref the viscéra of the great cavity.

Respiration, which consists in warm-blooded animals of a constant regular succession of alternate inspirations and expirations, hardly admitting even a very short interruption, is performed in reptiles at irregular and long intervals, admitting of very long suspension, and capable, therefore, in a much greater degree than in the former classes, of modification by the will of the animal. Hence Linnaeus defined a "pulmo arbitarius," or voluntary power over the respiratory function, as a distinguishing attribute of the class. The difference, however, between the reptiles and warm-blooded animals is in the length of time for which they can do without respiration: after a longer or shorter interval, its renewal is equally necessary to both.

All reptiles continue breathing constantly as long as they are awake; and the turtles most frequently of all. It is well known that they cannot remain long under water; but are obliged, at short intervals, to come to the surface for a fresh supply of air. Blumenbach observed water newts, when placed in a deep vessel of water, swim up to the top frequently for the purpose of drawing breath.

"On the whole, however," continues Blumenbach, "reptiles cannot go much longer without breathing than warm-blooded animals, but they can also continue unhurt in vitiated air for a much more considerable time.

"Tortoises have been known to live more than a month with their jaws tightly tied, and their nostrils enclosed with sealing-wax, (Mery, in Mem. de l'Acad. des Sciences, avant 1699, v. 2.) On the former point we may mention the puzzling, but sufficiently authenticated instances, of toads found alive in the middle of solid trunks of trees, and even in mazes of marble and other stones. (See Luidius in Lithophylae. Brittan. p. 112. Le Cat Allion du Lac, Melanges d'Hilloire Naturelle, v. 3. p. 95. Gentleman's Magazine, v. 26. 1756, p. 74. Guettard in Mem. sur differ. part. des Sciences et Arts, v. 4. p. 615. Hift. de l'Acad. des Sciences de Berlin, 1782.) There are numerous citations in Haller, de Corp. Hum. Fabr. et Funct. v. 7. p. 151, and Kaetner, in the Preface to the German version of the Stockholm Transactions, v. 3.

"Reptiles can also bear to breathe fixed and phlogistic air much longer than warm-blooded animals. In my experiments at the celebrated cavern of Pyrmont, I constantly found that pigeons could hardly be restored to life if their immersion in that bath of carbonic acid gas was protracted into the second minute. Frogs, however, recovered after staying in it five, six, seven, and even nine minutes. The event of similar trials, made in the famous grotto del Cane, near Naples, corresponds to these. (See Nollet, in the Mem. de l'Acad. des Sciences de Paris, 1750, p. 72. Murray, in the Swedish Transactions, 1775, v. 36, p. 249.) Della Torre found that a toad lived for half an hour in that grotto, and that a newt was still alive, after having been immersed in that pernicious atmosphere an hour and a quarter.

"Carminati has already shown how much sooner confined air proves fatal to warm-blooded animals, than to the amphibia. (De animalium ex mephitibus et noctis halibus interitu, p. 96.) When I enclosed two sparrows under one bell-glass, and two frogs under another of the same size, the former were perished in convulsions from the vitiated state of their air, while the atmosphere of the other glass had experienced no little change, that a candle or burning coals were not extinguished by it." Specimen, p. 1.

The experiments of Boyle (Philos. Trasf. 1670, N° 62.), and the Florentine academicians, which have been since most frequently repeated, have shown that serpents, frogs, &c. can remain very long (from two or three to ten or twelve hours) under an exhausted receiver.

The nature of the changes produced in the air by the respiration of reptiles, has been examined by Spallanzani (Rapports de l'air avec les etres organises, publies par Senebier, 3 tom. 8vo. Geneve, 1807); Mr. Ellis (Inquiry into the Changes produced on Atmospheric Air, &c. 1807, and Further Inquiry, &c. 1811) and others. The latter author presents us with a summary of all that has been ascertained, as well as with experiments of his own; we, therefore, extract them in his own words from the works just quoted.

"To obtain a knowledge of the specific changes which the air suffers by the respiration of the amphibia, the following experiments were instituted. A toad, supported on a small hoop, was enclosed in one hundred and eight cubic inches of atmospheric air contained in a jar inverted over water, and standing in a room varying from 55° to 60° Fahrenheit. He died on the fifth day. The water had risen considerably in the jar, and the residual air was still farther diminished by agitation with lime-water, which it rendered turbid. Fifty parts, after being washed in lime-water, were next shaken in the coudiometer with the liquid sulphuret of potash, and lost only one part of its bulk. The experiment was repeated by confining another toad, in the same manner, in another jar containing forty cubic inches of atmospheric air, inverted over mercury. Under the hoop which supported the animal, was placed a small cup, containing 1.5 cubic inch of the water of potash, which floated on the mercury. The whole was then set aside in a room, of the temperature of 64°. By the twelfth hour, the mercury had risen nearly half an inch into the jar, which was thickly moistened with vapour, and the breathing of the animal seemed rather languid; by the twenty-fourth hour, he breathed very faintly; and, by the twenty-fourth hour, he had ceased to breathe. The jar was allowed to stand some hours, at the end of which time the mercury stood about eight-tenths of an inch high, and one-tenth of an inch of fluid was deposited on its surface. The jar was now raised, and diluted sulphuric acid being poured into the alkaline solution, excited in it a very brisk effervescence. It is inferred, therefore, from these experiments, that the oxygogenous portion of the air almost entirely disappears and during the respiration of these animals, after which they cease to breathe; and that a large portion of carbonic acid is at the same period produced.

"Proceeding on the supposition, that the loss in the bulk of air, evinced by the ascent of the mercury, in the last of the foregoing experiments, arose from the attraction of the carbonic acid by the alkaline solution, we endeavoured to ascertain the proportion which this loss of bulk bore to that of the whole air originally employed. With this view a frog was procured, and placed in a jar of the capacity of forty cubic inches. Under the hoop which supported
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ported him, about half way up the jar, was placed a small cup, containing one cubic inch of the water of potassa; and the jar being then filled with atmospheric air, was inverted into a dish of mercury, and kept ready by a weight precluding upon it. In the room in which the animal was placed, the barometer stood at 29.2 inches, and the thermometer at 61°. At the end of twenty-nine hours, the animal was reeling quietly on the hoop, with no appearance of dilatation, and the mercury in the jar, when that in the dish was brought to a level with it, had risen five-tenths of an inch. In twenty-four hours more, the frog was still alive: his respiration seemed now to labour, and he rofed often to the top of the jar, as if deprivous of escaping, or of obtaining fresh air: the mercury had now risen to 1.15 of an inch. From this time, the difficulty of breathing continued to increase, and, at the close of the fifty-ninth hour, from the commencement of the experiment, after having lain quiet for a considerable time, he gave a convulsive struggle, and moved no more. The mercury in the dish was now brought to a level with that in the jar, and its height was 1.2 of an inch. The barometer, at this period, was 29.8, and the thermometer 63°.

In order to examine the residual air, we plunged the dish under water, which rising into the jar, displaced the mercury, and the cup, with its solution, was then withdrawn under water. The residual air suffered no diminution by being shaken with lime-water, nor by contact with phosphorus, but it left rather more than 28 of it by agitation with the liquid sulphuret of potassa. The jar originally held forty cubic inches, but the animal, with the hoop, cup, and solution, occupied a share equal to four, so that the actual bulk of air employed was 36 cubic inches. Having placed the jar on its bottom, water, to the quantity of 27 cubic inches, was poured in till it reached the point to which the mercury, during the experiment, had risen; and this, therefore, indicated the volume of residual air: it then required nine cubic inches more of water to fill the jar completely, which, consequently, was the bulk of air that had disappeared. Hence, therefore, we have $\frac{27 \times 29.8}{29.2} = 27.5547$, but $\frac{4 \times 27.554}{483} = 22819$ and $27.554 = 22819 = 27.32651$, the corrected volume of air at the close of the experiment.

But farther, $36 - 27.32651 = 8.67349$, and $\frac{8.67349}{36} = 0.2454$, so that the diminution of bulk which the air suffered in this experiment is rather greater than 0.2454, the proportion of oxygen gas which the atmosphere contains. In a second experiment, another frog lived in the same volume of air about 60 hours, and the diminution which it suffered, after making the necessary reductions, amounted to $\frac{1}{4.868}$ of the whole. Where the carbonic acid, formed by the respiration of another frog, was suffered to remain, the jar, after the death of the animal, adhered firmly to the faucer in which it was inverted, and, when cautiously elevated, the surrounding mercury rushed in; and occupied only about one-tenth of the space which it filled in the above-mentioned cases: the inferences deducible from these facts, instruct us, that the diminution which atmospheric air suffers by the respiration of these animals, bears a near proportion to the oxygen gas which it contains, when all the carbonic acid is removed: and as a small loss of bulk likewise takes place when this acid is allowed to remain, we must ascribe a part of the observed diminution to the necessary loss which always accompanies the conversion of oxygen gas into carbonic acid.

“It follows from the preceding series of experiments, that the oxygenous portion of the air is changed by the respiration of amphibious animals in the same manner as by that of the other classes, carbonic acid, in proportion thereto, being, in all cases, produced; and that when the whole, or nearly the whole, of that gas is so changed, the animal no longer survives. But, if the animal die when all the oxygen gas is changed, and all the air that has disappeared when the carbonic acid is removed, be oxygen gas, then the bulk of air that remains, and is unchanged, must consist wholly of nitrogen gas; and as this nitrogen gas, joined with the oxygen gas that has disappeared, makes up the whole bulk of air originally employed, it follows also, that, while the oxygen gas of the air has diminished and suffered change, the nitrogenous portion has continued undiminished and unaltered.

“During all these changes operated on the air contained in water, by the respiratory functions of aquatic animals, the water itself seems to suffer little or no alteration. Mr. Carlile took separate glazes, each containing one pound of distilled water, which was previously boiled to expel all its air, and then inverting them over mercury, he put into them one gold fih, one frog, two leeches, and one fresh-water musle. The animals were confined several days in these situations, and exposed to the sun during January, in temperature 43° and 48° Fahrenheit; but no air-bubbles were produced in the vessels, nor was there any sensible diminution of the water. The frog died on the third day, the fish on the fifth, the leeches on the eighth, and the musle on the thirteenth day. This experiment was made to ascertain the changes produced in water by the respiration of aquatic animals; but the water had not undergone any chemical alteration. See Croonian Lecture in the Phil. Tranf. 1805.” Inquiry, p. 83-88.

Mr. Ellis adduces some additional evidence in his Further Inquiry. “The experiments already detailed in the former work clearly prove, that frogs and toads which belong to this class, entirely convert, by respiration, the oxygen gas of the air into nearly an equal bulk of carbonic acid, without producing any change in its nitrogenous portion. Dr. Carra- dorii also discovered, that these animals lived much longer when they were immersed in water that had a free communication with the atmosphere, than when the air was excluded. (Phil. Mag. vol. 16. p. 245.) According to Spallanzani, frogs die sooner in boiled, than in common water. In their respiration, they consume oxygen, and form carbonic acid. Those which have been recently fed, consume more of this gas than those which have suffered a long abstinence. Under great cold they become lethargic, but their heart still continues to beat, and they still, in a smaller degree, continue to change the air; but the consummation of oxygen increases with the increase of temperature. These animals also change the air by their skin, as well as by their lungs; and act upon it after death, and under putrefaction. (Rapports, &c. tom. i. p. 468.) The ova of frogs were likewise found to require air to carry on their evolution. Small tadpoles, while yet attached to the egg, were confined in vessels half filled with water, while the other half contained air, or oxygen or nitrogen gas. Those in the two former vessels were perfectly developed, and became large enough to swim about; but those confined with nitrogen perished. Rapports, &c. tom. i. p. 466.

“Spallanzani extended his experiments to many other ani-
nalms of this class, and obtained similar results. Different species of serpents he found to die in hydrogen gas, or when confined under water, but to live in common air, and convert its oxygenous portion into carbonic acid. They became lethargic from cold, and the heart then beat very slowly, or not at all, the respiration was then also suspended, and little or no effect was produced in the air. The skin of these animals acted upon the air, as well as the lungs (Rapports, &c. tom. i. p. 249); and when the blood was reddened by exposure to the air, its oxygen also disappeared, and carbonic acid was produced. (Rapports, &c. tom. i. p. 239, 263.) Similar results were obtained in experiments on the respiration of vipers, tortoises, lizards, and salamanders. Rapports, &c. tom. i. p. 275, 287.

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"The preceding facts sufficiently show, that various animals in all the foregoing classes, and in every stage and form of their existence, require the presence of oxygen gas to maintain the functions of life; that this gas, by the exercise of these functions, is converted into carbonic acid; and that the degree in which this conversion proceeds, depends much on the healthy condition of the animal, and the vigour of its circulating system. Since, also, in every instance where the experiments have been made with the requisite accuracy, the bulk of carbonic acid produced, nearly or exactly equalled that of the oxygen which disappeared, we may conclude, from analogy, that fuch is universally the extent to which this change in the air takes place in animal respiration; and hence, farther, the nitrogen gas of the air appears to suffer no necessary change in the exercise of this function, we may also conclude, that as far as regards the air, the substitution of an equal bulk of carbonic acid for the oxygen gas that is lost, comprises the only essential change which the atmospheric experiences during the performance of this animal process." P. 269—

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Vital Temperature.—"Since the respiratory organs," says Blumenbach, "may, with great probability, from the numerous investigations and discoveries of the moderns, be regarded as the principal source of animal temperature, we follow a natural arrangement in passing from the consideration of their structure and functions, to a short view of the differences between the natural heat of reptiles and warm-blooded animals.

"Animals, whose lungs are most compact, receiving the greatest supply of blood, and furnished with all the apparatus necessary for sending the whole circulating mass through the minor circulation, are obliged to keep up the respiratory process uninterruptedly from the time of birth, expelling, instead of the pure aerial fluid which they inspire, a noxious air, which corropts the surrounding atmosphere if confined, posses a high natural temperature, about the 98th degree of Fahrenheit's scale in man, rather higher in some mammalia, and particularly in birds. In reptiles, on the contrary, posseying lungs of a rare and loose texture, with comparatively slender supply of blood, respiration is irregular, interrupted, and in some measure arbitrary; they very slowly vitiate confined air; and exhibit a temperature exceeding, by a few degrees only, that of the surrounding atmosphere. One or two degrees, I say, according to the results of accurate observation on tortoises (Wilhalm Chelonograph. p. 26.): for my own experiments on amphibia have not exhibited results sufficiently confant to allow me to draw any certain inference from them." (Specimen, &c. p. 18.)

Braun, indeed, has ascertained, in the Nov. Comment. Acad. Petropol. t. 13. p. 427, that frogs posse only the temperature of the surrounding medium; but the facts which we shall advance prefently, completely disprove this affection.

The power which modern investigations have proved warm-blooded animals, and more particularly the human subject, to posse in to high a degree, of being able to endure exposure to heat much above the natural temperature of the body, without having their own heat increased; and, on the contrary, of being, with equal facility, the most intemperate, is not withheld from the amphibia, as is proved by the facts which we have related, in order to shew the tenacity of life in this class. It is not, indeed, clear in these cases, as in the experiments, of which man and different mammalia have been the subjects, that the reptiles, when exposed to a degree of heat greater or less than their own, have maintained their own temperature at a uniform standard; on the contrary, indeed, it seems that in a great cold their heat is abstracted, and they become frozen; and it will also be seen, from facts to be brought forward presently, that their heat is variously changed under different circumstances. Now we know that the temperature of the mammalia is not raised beyond its natural level by exposure in an atmospheric medium of 280° Fahr. (see Tillet in Mem. de l'Acad. des Sciences, 1764); and that its standard is equally undisturbed, when the atmosphere is below the freezing point of mercury. (See Heat, Animal, and Man.) We may therefore safely affer that man and the mammalia very far exceed reptiles in the power of refitting either great heat or cold; that is, of maintaining a standard temperature under the action of a surrounding atmosphere, considerably exceeding or falling short of their own temperature. The following summary of facts, concerning the temperature of reptiles, is taken from Mr. Ellis's Inquiry.

"Amphibious animals exhibit a great variety in the structure of the respiratory organs, and, consequently, in the degrees of animal heat. Frogs and land tortoises posse a temperature about five degrees higher than that of the medium they inhabit, according to Dr. Martine. The fame may be said of sea-tortoises, toads, vipers, and all the reptile kind, all of whom have lungs of the same fabric and the same cold constitution of body. (Essay on Thermometers, p. 142.) Mr. Hunter observed that the frog and toad were about four or five degrees warmer than the atmosphere when it was at 35° or 36°; and that, some hours after death, they gradually fell down to the temperature of the surrounding air. (Treatise on the Blood, p. 298.) The difference of temperature appears to increase in a warmer atmosphere; for Mr. Carlile kept three frogs for many days in an equable atmosphere of 54°, and their flomachs preferred a temperature of 62°. (Philos. Transact. 1805, pt. 1.) In an atmosphere of 58°, Mr. Hunter found the thermometer, introduced into the flomach of a healthy viper, to stand at 68°; but, after the animal was put into a pan, and the pan into a cold mixture of 10°, where it remained about ten minutes, the heat was reduced to 37°, and, in twenty minutes more, to 31°, nor did it sink lower; its tail now began to freeze, and the animal was very weak. A frog also, whose temperature was 45°, when put into a cold mixture, soon fell down to 31°; and beyond this point it was not possible to leffen the heat without destroying the animal. (Obf. on the Animal Economy, p. 104.) A toad being placed in cold water, just deep enough not to cover its mouth, the whole was put into a cold mixture between 10° and 15°. The water froze around the toad, and, as it were, clozed him in, but he did not die, and therefore was not frozen. Why the animals, mentioned in these experiments, died before they were frozen, while those which are

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exposed to the atmosphere, in very cold climates, do not die, is a point which Mr. Hunter does not pretend to determine; not knowing the difference, he says, between the effects of a natural and artificial cold. Ibid. p. 89, 90.

"The experiments of Mr. Hunter farther prove that the temperature of most of the foregoing animals not only falls rapidly in a colder medium, but that it rises more quickly in a warmer one than that of those which pollute a higher standard temperature. In the flomach of a frog, the thermometer role from 45° to 49°; the animal was then placed in an atmosphere made warm by heated water, where it remained for twenty minutes, and upon introducing the thermometer again into the stomach, the mercury rose to 64°. (Ibid. p. 92.) A healthy viper was put into an atmosphere of 108°; and, in seven minutes, the heat of the animal, both in the stomach and anus, was found to be 92°.5, beyond which it could not be raised in the above heat. An eel, very weak, whose heat was 44°, which was nearly that of the atmosphere, was put into water heated to 65°, for fifteen minutes; and, upon examination, it was of the same degree of heat with the water. The heat of a bench was, in ten minutes, raised from 41° to 55°, both in the stomach and rectum, by being put into water at 65°."

"He found also, that a living and dead trench, and a living and dead eel, put together into warm water, received heat equally fast; and when they were exposed to cold, both the living and the dead admitted the cold likewise with equal quickness. (Ibid. 104, 105.) Hence, therefore, the animal heat, in all the classes of animals hitherto mentioned, whether they inhabit the air or the water, seems to follow nearly that of the medium in which they are placed; and their standard temperature cannot, in consequence, be restricted to any fixed point, but must be considered always in relation to that of their surrounding medium.

"Notwithstanding, however, the low degree of heat which these several classes of animals pollute, hardly, in some instances, exceeding that of the medium in which they live, yet this small excess is a proof that they pollute, within themselves, a power of producing heat. The loss of heat which infects fumer under cold, the fall of temperature which many of the vermes clafs undergo from the fame cause, the melting of snow by the heat of fishes, and the decline of animal heat which the amphibia, when exposed to great cold, experience, all demonstrate that the surrounding medium, whether it be air or water, is constantly drawing off their heat, which renders necessary as confant a re-production of it." P. 218—221.

The great size and beautiful structure of the lungs of reptiles lead us to conclude that they are very important organs in the economy of these animals, although their uses and relations are not yet satisfactorily ascertained. It seems tolerably certain, that besides their office as respiratory organs, they render the body lighter for swimming in many instances: in this point of view they may be compared to the swimming bladder of fih. It is by the inflation of its large lungs, that the camelon can diftend its body fo remarkably.

"The lungs, too," says Blumenbach, "are subfervient in many reptiles to the production of sound; — I fay in many, because fome fpecies, even of our reptiles, are, as far as I know, completely dumb; e.g. the falamander, lacerta agilis (green lizard), and anguis fragilis (blind-worm); and others utter found very rarely, and only when in great danger, as the water newts ; refembling, in that respect, the mole and hare, which do not cry out until great violence is offered them.

"It has been reported that fome mammalia lose their voice in particular situations, as dogs in certain parts of America; the fame thing has been reported of reptiles, for example frogs, which G. F. Müller found to be dumb in many regions of Afiatic Raffia. Sammlung Ruffifcher Gefichteth, vii. p. 123." Blumenbach, Specimen, &c. p. 15.

Organs of Voice.—The larynx, varying in different genera, as in the other classes, has these characters in common; viz. that it has no epiglottis, and is composed of pieces analogous to those of the upper larynx of birds. This is the only vocal organ; there is never an inferior larynx, as in birds. The voice cannot be modified by lips or velum; palatine, since they do not exist. The degree of aperture of the mouth, and the motions of the tongue, are alone capable of modifying the action of the larynx.

The cartilaginous skeleton of the crocodile's larynx contains five pieces: a nearly square plate, compounding all the under surface of the cavity. Two circular pieces or handles, fixed near together at one end, in the middle of the front edge of the plate, and at the other, in the middle of the side. Their body is a little elevated above the square plate, and leaves on each side, between it and that plate, a membranous hollow. The anterior extremity of each piece forms a lateral and vertical prominence, constituting a kind of pillar under the glottis. To the posterior external angle of this plate, a branch is fixed on each side; these join together above, and form, with the back edge of the plate, a complete ring, which is the beginning of the trachea.

The glottis is merely membranous, extending from the junction of the two last-mentioned branches to the middle of the os hyoidei, where the membranes composing it are attached. There are neither ventricles nor chordae vocales. Two muscles act on this apparatus. One comes from below the great plate, surrounds the larynx, ascending obliquely backwards, and joins the corresponding muscle of the other side behind the glottis, which has the power of closing. The other comes from below the back edge of the same plate; descends the former, ascending obliquely forwards, and is fixed to the edge of the glottis, which it opens. The first half of the glottis corresponds then to the broad and flat cavity of the larynx; the second, beginning from the two pillars, is merely a long and narrow slit. It is only by striking against the two pillars, that the air can produce a whistling noise, if indeed any fuch be produced at all.

The glottis of the crocodile of the Orinoco, says Humbold, is surrounded by a thick fleshy ring with circular fibres, which the animal can contract to fuch a degree, that the slit or opening of the trachea cannot be distinguished. The glottis lies on a round and flat cartilage, analogous to the thyroid of mammalia. The upper part of the trachea prefers a singular structure, which we mention here, because it seems subfervient to the production of sound. The first nine cartilages are not complete rings, but are joined together above by a transparent, very thin and tenué membrane. (See Humboldt Recueil d'Observations de Zoologie et d'Anatomie comparée, t. 1. pag. 111, pl. 4.) Geoffroy observed ten annuli thus united in the Nilotic crocodile; Duverney sixteen, in a crocodile dissected at the Academy of Sciences, and the Jefuit Missionaries in Siam a larger number. To this membrane, stretched like the parchment of a drum, and thrown into vibrations by the air, the deep and terrific howlings or bellowings of these dangerous reptiles are ascribed; the glottis being at the same time closed by its muscular ring. Annales du Museum, t. 2. p. 46.

In the iguana, the pillars are scarcely more prominent within than the rest of the parietes; the glottis is very short,
short, and the inferior plate goes forwards and becomes broader, being turned up to form the rudiment of an epiglottis.

The same simplicity of structure prevails in the tupinambis, the common lizard, the tortoises, and serpents; an inferior plate, and two lateral pieces narrowing a little the edges of the glottis. These animals can only be capable of producing hissing sounds.

The mud totoio has, at the bottom of its organ, a rounded depression, which is not so well marked in the turtle; but it has not any vocal chords. In a great land tortoiose of Madagascar, there is a triangular membranous crista, attached to the lower part of the larynx, and ascending in the glottis, which it divides into two. This is analogous to a structure very common in the upper larynx of birds. The edges of the glottis are flat, sharp on the outside, and touch completely.

In the finch, the edge of the glottis is turned a little inwards to form a tenue membrane, directed backwards.

In the camelion there are pillars, nearly as in the crocodile, but they are each furnished with a tenue membrane directed backwards, and very fit for vibration. In front of them, on each side, a leathery protuberance is observed, contradicting the glottis, which is very short, and terminating in front by a transverse slit. But the most remarkable circumstance about the larynx of the camelion, is a small membranous sac opening below, between the inferior plate of the larynx, and the first ring of the trachea.

Neither the iguanas nor the dragons possess a similar fac, although we observe in them goitres on the outside: these prominences have no relation to the vocal organs.

The frogs, which are so noisy, have a larynx fitable to this character. In a little and prominence of its vocal chords. The inferior plate of the larynx is a slender transverse branch, bearing on each side a large ring, which is the origin of the bronchus; for, in these animals there is no tracheal tube. On the front of the transverse branch, two oval pieces are articulated, convex externally, and concave internally, so as to resemble kettle-drums. On the lower edge of each a membrane is stretched internally, which opposes at right angles the course of the air. The edge of this membrane forms the chorda vocalis, which is consequently more isolated than the cartilages, and freer than in any other animal. Above it is the opening of the ventricle of the glottis, occupying all the concavity of the cartilaginous tube. The upper edge of this cartilage forms the margin of the glottis properly so called. Vieq d’Azyr conceived that the ventricles communicate by their bottom with the bronchi, and thus ascribed three openings to the larynx of frogs: but this is a mistake.

Befides this apparatus, which is extremely fonorous, male frogs have two bags, each of which opens by a small hole, not in the larynx, but in the bottom of the mouth, at its sides. They pass under the arch of the lower jaw, to make a prominence under the skin on each side under the ear. These bags are dilated when the frogs are croaking. They are covered by a mucutar tissue capable of compressing them. The female frogs, and toads of both sexes, and the tree-frogs, are destitute of the bags: but the latter have a simple sac under the throat. In this larynx there is a muscle on each side to separate the oval cartilages; and a transverse one in front, pulling between them, and calculated to approximate them. For representations of these laryngeal faces in the frog, see the German collection of Camper’s smaller writings, vol. 1. pt. 1. pag. 144. tab. 3. figs. 1—4. Vieq d’Azyr has represented the rings glutidos of the tortoiso, frog, and serpents, in the Memoires de l’Acad. des Sciences. 1779, tab. 13; and Tyfon that of the rattlesnake, in the Philos. Trans. vol. 13. The chorda vocales, too, are larger in the male than in the female frog.

Voice of Reptiles.—The tortoises and turtles are said to have the power of producing a more or less strong hissing, when affected by any lively feeling; but we do not know of any very clear and satisfactory testimony on the subject. Pliny’s observation about the roaring of turtles when floating asleep on the water, has not been confirmed. The large iguanas utter harsh whistling or hissing sounds as they run about the tops of trees. Several serpents hiss, and the large species very loudly. The noise made by the tail of the rattlesnake is not a vocal sound, but produced by a peculiar organ, which we shall describe.

Daudin affirms, that falamanders produce two kinds of feeble sound found out of the water; the first is a low found, produced in the throat, which they swell for that purpose; the secong consists in a flight striking of the two lips together, without any motion of the throat.

According to the traveller Bartram, crocodiles produce most prodigious noises. The sound is terrible, particularly in the spring, when these dangerous animals copulate. The noise resembles distant thunder, shaking the country and making it re-echo far and wide. When they are thus belowing by hundreds and thousands at a time, we might suppose, says Bartram, that some violent shock agitates the globe, and shakes it to its very foundations. He also states, that when they strike their jaws together they make a surprizing noise, like that of a heavy plank forcibly beaten against the ground.

Humboldt says that the young crocodiles make a noise like cats; and that they utter very piercing cries, just after escaping from the egg, if attacked by a dog. He never heard any vocal sound produced by the old crocodiles; although he lived among them five years, and the fire often attracted them within a few paces of the tents at night. The Indians asserted that the crocodile makes a noise like that of a cow; that its voice is very terrific, but seldom heard, and sometimes just before an earthquake, the approach of which they are said to discover. Recueil d’Obf. de Zool. et d’Anat. Comp. p. 11.

Organs of the Generative Functions.—There is a very close analogy in the structure of these parts between reptiles and birds: in both classes there is a cloaca, that is, a cavity common to the generative organs, the sexes, and the urine; in both the male has testicles inclosed in the abdomen, while the female organs consist of ovaries and oviducts. The young being leaves the mother in the form of a small egg, which is generally developed out of the body. The generative process, however, in many instances, exhibits in this class very striking peculiarities.

Male Organs.—The testicles: the situation and structure of these glands in the three first orders are very analogous to those which they have in birds. They are constantly found in the abdominal cavity, united to the inferior surface of the kidneys (in the cheloniens), in front of the latter viscera on each side of the vertebral column (in the faurians and opilionians), or immediately under their anterior portion (in the batracians). Their form varies in the different genera; they are separated, in the salamanders, into two spherical bodies, placed one before the other.

The kidney, testis, and epididymis, lie close together in the te thịtines, according to Blumenbach; but each of the three organs may be distinguished by its peculiar colour and structure on the first view. There is much obscurity in the different descriptions of the male organs in the turtle and tortoise. Schneider has collected the various obser-
Organ of Copulation.—There are two species of union between the male and female. In the greater number there is a male organ introduced into the body of the female, and conveying the fecundating liquor; but in the batracians, which have no male organ, there is merely a conjunction of their bodies; it is a prehension by the male rather than a true copulation.

In the males of those batracians which copulate thus, there is a peculiar organization of the skin of the hand. Fimb tubercles, composed of hard, blackish or brown papilla, cover not only the thumb, but also the palm of the hand. These being pressed into the skin of the female, give the male a very firm hold. They disappar after the season of copulation, and are not seen again until that season recurs. The copulation of the frog kind is effected in the following way: the male ascends the back of the female, places his front limbs under her axle, and carries them round the chest, until the fingers crofs in front. He continues grasping her firmly in this way until the laying is finifhed. The posterior part of his body paffes beyond that of the female, fo that he can fecundate the eggs as they are expelled, and he is faid to affift in that operation. They remain joined for severai days, and the graft of the male is to firm, that great force is neceffary to separate him. Convolution and laceration of the breat, and even the death of the female, foldows the violent fhaking of the male. (See Spallanzani's Differtations, vol. i. p. 17.) The males are more brillian at the season of copulation, which takes place only once a year, in the early spring; they inflate their vocal bladders more frequently, and indulge in their croaking notes.

In the falamanders a creaf, with divided edge, appears on the back and tail, and is afterwards, in great measure, loft.

The duration of copulation in the frogs is inversely proportionai to the warmth of the atmosphere. When this is confiderable, the female will be free in five or fix days; but, in a cold season, the embraces of the male continue for eight or nine days. The season of re-produuction is the beginning of spring; in the very firit days, the frogs begin to flir themselves in our mafsies and ponds; they copulate, lay and fecundate their eggs very foon. At the fame season, the tortoifes, lizards, and ferpents, accomplish the fame procfes. Sometimes frogs are found united even before the frofs have ended. Daunin found two frogs in copulation in the middle of February, the thermometer of Reaumur at 3° above zero; it defended in the night to 4° below zero; and the pond was frozen for two days; at the end of which time the female began to lay. Hist. Nat. des Reptiles, vol. i. p. 207, 208.

One of the toads, on which Spallanzani made his experiments, copulates in the beginning of March or end of February, before all the snow is melted; the proces lafts ten, twelve, fourteen, or even twenty days, if the feafon be cold. Spallanzani, ch. 3.

The abdomen swells greatly in both fexes during copulation; in the female, from the enlargement of the ova; in the male, from the deposition under the skin of a very limpid water, which disappears after the laying.

The tree-frogs, at leaft that of Europe (hyla viridis) do not copulate like the frog and toad. The male fixes himfelf on the female, by merely applying his anterior paws under her axil, and employing the tubercles of the fingers. He remains in this flation for twelve or fifteen hours, or even, according to Roefel, three days.

The falamanders do not copulate at all; the male places his head on that of the female, and dicharges the feminal fluid, which is received by the female organs. See Spallanzani,
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zani, Diff. vol. 2; and Latreille, Histoire Naturelle des Salamandres de France.

Pent.-The chelonians have one; most of the faurians, and the ophidians, have two; and the batracians none. There is a papilla in the cloaca, in place of the penis, but none in the toad.

The relative size of the organ is more considerable in the chelonians than in the mammalia and birds. It is long, nearly cylindrical, and expanded at the end, which terminates in an obtuse hook-like point, somewhat resembling the end of the elephant's trunk. A deep groove runs along the whole upper surface of the member, and is even deeper near the glans. It terminates on the broad expanded end of the latter, by an orifice divided into two by a papilla. The approximation of its edges converts this groove into a canal; it supplies the place of the urethra. This penis is composed of two corpora cavernosa, confounded together in a part of its extent. They begin by two vascular swellings analogous to the bulb of the urethra; their tisue is continued into two canals, of which the fibrous varieties, at first thin, soon become very thick, while their cavities diminish, and are united near the glans into one. The whole large swelling composing the glans is merely a development of the vascular tisue of the latter, covered by a loose and plaited skin, and supported by a prolongation of the fibrous side of the corpus cavernosum.

The skin of the groove is covered by a cavernous texture, analogous to that of the oltrich; and there is, on each side of this groove, a canal, the orifice of which is in the cavity of the peritoneum, on each side of the bladder, while the canal itself is prolonged in the substance of the penis, as far as the glans, where it ends in a cul-de-sac, without its sides appearing perforated in any part.

The penis has two retractor muscles, arising in the pelvis, and reaching as far as the glans. They fold back the penis in the cloaca, so that, like the penis of the oltrich, it fluts the orifice of the rectum, and that of the bladder. Erection, and the action of the sphincter, bring it out of the cavity.

The penises of the lizards and serpents are short, cylin- drical, commonly beset with white, hard, and pointed papilla, which have been tolerably well compared to the prickles of the hedge-hog. These organs, in their collapsed state, are drawn within the skin of the tail: when erect they are protruded, and appear at each angle of the external slit of the cloaca. They have two retractor muscles, arising under the first caudal vertebra. Tyfon has figured the penis of the rattle snake and viper in the Philos. Trans. v. 13, tab. 15; and the latter is minutely described by Charas.

The penis of the crocodile is large, and lodged in a fold of the anterior part of the cloaca. It is composed of a firm cartilaginous substance, terminated by a glans of softer texture. It is excavated in its whole length by a deep groove. It has a very large retractor muscle, which is so considerable as to cause a swelling of the tail.

In the faurian reptiles, as in the frog and salamanders, the male fixes himself on the female, and obliges her to turn towards him the posterior part of her body, and a real copulation ensues.

The act is differently accomplished in the serpents: the male and female twine round each other, are closely con- nected by several turns, and remain thus adherent for one or two hours. Is the small horned sparrow, satiated on each side of the anus in the bose, and retracted under the skin, employed at all by the serpent as an organ of prehension, like the cutaneous tubercles of the hand of the rane? The faurians and serpents conceal themselves carefully for this purpose.

Although the chelonian reptiles seem so little calculated for copulation, this process takes place in them, the male fixing himself to the female by attaching the nails of his front limbs to the soft skin of her neck. Naturalists are still uncertain, whether turtles are joined plastron to plas- tron, as Lacépède has asserted in his Natural History of Oviparous Quadrupeds, or whether the male mounts on the back of the female, as Bomare has represented it in his Dictionnaire d'Histoire Naturelle. From the word caudal, employed by the French mariners to denote this union, we may infer that they copulate like the frogs: the expression denotes clearly that the male is mounted on the female as the stallion is on the mare (cavalle). Catesby, in his Natural Histo- ry of Carolina, affirms that they remain united for many days.

Female Organs of Generation.-Reptiles have two ovaries, usually much more considerable than the single ovary of birds. For most of the year these bodies are small; but they acquire, at the propa- gating season, an extraordinary development, and thus dis- tend the abdomen very remarkably. This is particularly observable in the frog kind.

In autumn and winter, says Spallanzani, the imma- ture eggs lie all in the ovarium, which is divided into two lobes; these lobes consist of leifer lobes, each of which is invested with a peculiar membrane. The eggs are of two sizes; some very small, so as to be scarcely visible with the naked eye; others seven or eight times larger; both kinds are globular. The smaller are of a livid grey colour: of the larger one hemisphere is white, the other black. The flighted touch is sufficient to burst them, after which they are resolved into a cinerous viscid liquor. (Dissertations, v. 1. § 4.) The black spots of the surface, supposed by Valinieri and others to be the rudiments of the tadpole, are attached to the internal membrane, and have no connection with the eggs. In the spring the eggs of the largest kind are still larger, and they are mature when copulation takes place. In the first periods of copulation, they are found in the sac of the ovarium; during the suc- ceeding times, partly in the ovarium, and partly in the ovi- ducts, where they become enveloped by their covering of viscid transparent mucilage.

The ovaria of the salamander contain a multitude of little eggs of a yellowish-white colour, smaller than husked millet, and not floating loose in the cavity of the ovaria, but adhering to their sides. These increase in size at the approach of spring.

The ovaria are connected to two long productions of peritoneum, which are fixed on each side of the spine down to the pelvis. The ova are ranged along the loofe edge of this fold, either in a single row, as in the chelonians, or agglomerated in a much larger number, as in the batrachians. Their blood-vessels extend between the lamina of these membranous productions. In the batrachians there are yellow fatty appendages to the ovaries, like those of the teficles.

In the serpents, like all their other viscera, they partake of the elongated figure of the body. The ova, consisting of yellow vehicles, resemble rows of seeds.

Ovi-ducts.-There are two in all reptiles, like their ovaries. They are membranous canals, fixed on each side of the vertebral column by a production of peritoneum. They commence by an expanded orifice (imbriated opening of the Fal- logian tube in mammalia), at which the ova enter. The tube is first conical, diminishing a little in size; then it is cylindrical in the rest of its course, which has a much greater propor-
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Jn consequence of this length of the canal it is plagted on the production of the peritoneum in the chelonian, saurian, and ophidian orders, or extremely thin and folded on itself in the batracians. When the curvatures are destroyed, and the duct is stretched in a straight line, it is four times the length of the animal in the falkmander. 

The thick fleshy part of the oviduct in the tortoises has been frequently called the uterus: the two oviducts open separately. Cadalzi observes, into ane Tartarurthe, tab. 6, fig. 10.

An uterus is also spoken of by some in the frogs, although the generation of these animals has nothing in it like utero-genitation, and the ova are simply transmitted through the tubes, without being retained in them to undergo any part of their development. "The frogs of this country," says Blumenbach, "have a large uterus divided by an internal partition into two cavities, from which two long convoluted oviducts arise, and terminate by open orifices at the sides of the heart. As the ovari lie under the liver, it is difficult to understand how the ova get into the above-mentioned openings. The uterus opens into the cloaca." (Comparative Anatomy, translated by Lawrence, p. 446.) 

"The toads have not the large uterus, but their oviducts terminate by a common tube in the cloaca." (Ibid.) For delineations of these parts in the frog and toad, see Roezel, tab. 6, 7, 8, and 21. The rana pipa (Surinam toad) has the same structure. See Camper in the 9th vol. of Commentat. Soc. Reg. Scient. Gotting. p. 129. Also in his Kleine Schriften, v. 1. pt. 1. tab. 3. fig. 1.

Female Organs of Copulation.—The male penis in copulation pales into the female cloaca. Does it go into the oviduct?

The chelonian reptiles have a clitoris very analogous to the penis of the male, from which it differs only in its smaller size. It is long, grooved lengthwise, and terminated by a rounded grain. Retractor muscles, analogous to those of the penis, draw back the clitoris into the cloaca, when it has been extended.

No clitoris has been discovered in the other reptiles.

Dorso Cells of the Rana Pipa (Surinam toad, bufo dorfiger).—It is singular enough to meet with in a toad a structure analogous to that of the abdominal pouch of the marsupial mammalia. The skin of the back is excavated in the female pipa by a large number of cells, (of which, Cuvier says, eighty have been counted,) in which the ova are placed, and changed into tadpoles, and the latter grow and are metamorphosed. As far as an examination of individuals, preferred for a long time in spirits of wine, will enable us to judge, the parietes of these cells do not seem to have any thing in their organization different from the rest of the skin.

Naturalists supposed at first, that the ova grew on the back of the female, and that the male fecundated them in that situation; but observation of the living animal, and anatomical investigations, have thrown the incorrectness of this notion; have proved, that the generative organs resemble those of other female toads; that the pipa lays her eggs like the other toads; and that the male fastened on her, as in the ordinary mode; belonging to this order, covers her with the eggs after they have been fecundated. The eggs are then enveloped in a fluid, which causes the skin of the back to swell round them: thus they are contained in rounded cavities. The tadpoles are produced there, with their membraneous tails, and are developed in this situation, which they do not quit until they have reached their perfect state. The female then carries the ova to differ from her back, by rubbing it against hard substances. Besides the works of Camper already referred to, concerning the anatomy of this extraordinary creature, see Blumenbach's Abbildungen, No 36, for excellent figures of the animal, and of its young in three states: 1st, as a long-tailed tadpole, with small processes of hind legs, and no trace of fore limbs; 2dly, as a four-footed creature, with the tail reduced to an insignificant size; and 3dly, with the tail entirely removed. The skeleton is figured by Schneider, in his Hift. Amphib. Faelce. 1.

Physiology of the Generative Organs.—In the whole class it is quite obvious, that the germ or rudiment of the new being is produced by the female in the ovarium, a point which does not admit of direct proof in the mammalia. This "pre-existence of the germ" to the act of copulation, and its formation in a peculiar organ of the female, demonstrated to clearly in reptiles, illustrate one of the most curious points in the theory of the natural reproduction of organized beings, or generation, and overturn many of the speculations on that subject. These germs acquire considerable size in the ovaries, and are therefore distinctly visible before the approach of the male. They pass from the parts just mentioned into the oviducts, and thence out of the body through the cloaca, having received in their passage through the ducts some external coverings. An application of the fecundating liquor secreted by the male is necessary to the evolution of these germs; they may be ejected from the body without the embrace of the male, as in the frog, toad, or newt, if they are forcibly separated from the male after copulation has begun, but then they are not evolved.

Swammerdam and Roezel were of opinion, that the eggs were loofe in the abdominal cavity, and taken up thence by the oviduct. Spallanzani found them in the abdomen only thrice in more than two thousand dissections; and hence supposes that the circumstance must have been a deviation from the accustomed course in these influences.

Although the motions and vital functions of reptiles seem very languid in comparison to those of the warm-blooded chilizes, they exhibit considerable ardor and manifestations of lively feeling in their amours. "As soon," says Spallanzani, "as the eggs begin to be discharged, the agitation of the female is extreme; she starts backwards and forwards, rises towards the surface of the water, and then sinks, keeping the hind legs constantly stretched out, and croaking in a low voice. The male, keeping his hind legs close to his body, throws himself into strange contortions, and accompanies the croaking of the female with a kind of interrupted noise, which I cannot express by words." Dissertations, v. 2. § 11.

In the work just quoted, which contains the most original and interesting collection of facts concerning the whole affair of generation, Spallanzani gives the following account of the amours of the water newt, which are the more curious, inasmuch as there is not only no real copulation by the introduction of a male member into the female, but not even any conjunction of the bodies, as in frogs and toads. "The male pursues the female, which at first makes a show of flying, but then stops of her own accord. He then approaches her in such a manner, that the lower part of his head comes in contact with the upper part of the head of the female; and this is done while the animals are in such a posture; that their bodies form an angle,
angle, of which the point is made by the union of the two heads; or they may only join muzzle to muzzle. The bodies are always very near together, so that the angle formed by the two heads or muzzles is always very acute. Then the male erects that dentated prominence, which is placed on his back, and agitates it in a curious manner: he also moves his tail briskly, bending it about, and striking very gently the sides of the female. During this time he emits from the aperture of the anus, now unusually tumid and dilated, a copious jet of semen, which mixes with the water, and thus diluted arrives at the anus of the female, also more enlarged than usual. In this important operation, then, the function of the male is never in contact with that of the female, which maintains a greater or smaller distance, and never flows any part characteristic of her sex. After the male has discharged this jet of semen, he rests for a while, or on some occasions quitting the female; he then returns to his employment, and repeats the contortions of his tail, and the emission of semen." § 80.

In the land newts there is a momentary copulation: "in the clearest days, and in the places most exposed to the sun, the male runs after the female, and when he has overtaken her, he twines himself about her, and unites his genitals to her's, but this union may be termed momentary, after which they part." § 81.

The vehement of the propensity in amphibia is so remarkable, that they actually will copulate with other species, as frogs with toads, &c. No example of hybrid offspring, from such a conjunction, has been recorded. It has also been known, that frogs, in want of a female, have copulated with other males, or with dead females.

That the animals are entirely absorbed by the powerful emotions accompanying this act is evinced by a series of disgusting experiments of Spallanzani, pufhed and multiplied with an unrelenting and unnecessary cruelty, and related quite coolly, without evidence of remorse or the slightest apology. He pricked, cut, and hacked the male frog and toads, without making them loofe their hold; amputation of the limbs, and of the head, was equally ineffectual.

Males, after suffering amputation of the fore or hind limbs, renewed their situation, and completed the generative act. "Nay, even the decapitation of a frog did not stop the embraces or ecuation. It is well known, that these animals are so tenacious of life, that that operation does not take it away immediately. That of which I am speaking was thrown into convulsions; but neither the fore-feet nor legs quitted the breast of the female, which brought forth her fetuses in an hour and three quarters, and I was an eye-witness to the male's beprinkling them with semen; that they were fecundated there can be no doubt, since they came to life at the usual time. As soon as he had performed this operation, he deserted his situation, and died in four hours afterwards." Dillertations, v. 2. § 90 and 100.

All reptiles may be said to be oviparous; an egg, containing the germ, and as much nourishment as is necessary to support it until it is sufficiently developed to leave this abode, is formed in the body of the mother, and enters the oviduct in all. But there is a subdivision, according to the sublquent progres of the egg thus produced. In the greatest number of reptiles, the ova or eggs are laid by the female in that state, and the young reptiles are developed afterwards; but in some, as the venemous serpents, and the true salamander, the ovum may be said to be hatched in the oviduct, although the animals still come into the world so far enveloped by the membranes, that the character of an oviparous generation is preferred. The reptiles of the latter kind are called ovoviviparous.

In both these cases, a real egg, like that of birds, is produced, and has no connection with the body of the mother; it is a very different thing from the ovum of the mammiferous animals, in which there is no supply of nourishment for the fetus; and the latter is connected by the umbilical chord with the vesicles of the mother, and derives from this source the materials of its growth. Here, as no true egg is produced in any part of the procefs, and as the young are always brought into the world alive, they may be justly termed viviparous. See Lacépéde, Hist. Nature des Serpens, t. I. p. 51.

In the common term ovum, we do not mean to represent that the thing produced is the famne in all; nor that it is like the egg of birds in all. There are varieties in the different orders, and, in the batracians at least, there is not a very close analogy to the ova of birds.

The eggs of reptiles are covered with a membraneous, rather than calcareous shell; but there is some earthy matter in it. In the green turtle this shell is flexible, but contains earthy particles. It is composed of a soft membrane, containing albumen, which heat does not harden, and a yolk which it does. The eggs of lizards have a more or less hard shell; it is flexible in the grey lizard, hard in the fennik mabouya, and the crocodile. It has been ascertained, that the eggs of the iguana are not hardened by boiling. The covering of the egg is soft and calcareas in serpents. The batracians lay gelatinous and semitransparent eggs, without any covering.

A part, corresponding more or less closely to the yolk of a bird's egg, is produced in the ovary, escapes from its membraneous covering, and enters the oviduct, where it receives its external investment, as the yolk of the bird's egg receives its shell and albumen. In the turtle, the procefs seems very similar to what we see in birds. There are numerous large yolks observed in the ovarium, contained in calyces; and these, when boiled, are very similar to the yolks of birds. In the crocodile and serpents, it is nearly the same. But in frogs, toads, and newts, the egg in the ovary does not seem to be a yolk, but the rudiment of the tadpole; and it comes forth, surrounded by a quantity of transparent glutinous matter. In the toad and newt, these rudiments are formed into long cords by the glutinous medium, which cords are double in the toad. In the frog they come out separately in so many spheres of the glutinous matter, about the size of large peas.

In all the reptiles which have a penis, fecundation is effected within the body; but in the batracians, which have no male organ of copulation, it occurs externally. When frogs are joined, it may be seen, that an obtuse, tumid point, occupying the place of the penis, is elongated, and brought towards the eggs nearest the vent. By taking them out of water while this laying is going on, an actual discharge of seminal fluid upon the eggs may be seen from this point. In the same way the male of the water newt discharges his fluid into the water near the anus of the female, and thus fecundation takes place. Spallanzani has instituted an immense number of experiments on this subject; he proved, that if breeches be put on the frog, so as to receive the seminal fluid, no fecundation occurs; while, on the contrary, the seminal fluid from the epididymis, or the juice of the teledicles, will produce artificial fecundation of eggs laid by the female after the male has been removed, and otherwise unproductive, or of eggs taken out of the lower part of the oviducit immediately after death. Dilution of the semen fluid, although it diminished the effect of its application, did
did not altogether prevent it. When three grains of feed were added to twenty-two pounds of water, some tadpoles were evolved in it, but much fewer than in a stronger mixture.

As fecundation is effected in these animals by the seminal fluid discharged in water, it probably is always produced by an extremely small proportion. Spallanzani has made some calculations, in order to find out the expression in numbers of the quantity of semen that was efficacious in some of his experiments. He mixed three grains of seminal fluid with eighteen ounces of water, and found that a globule, 1/6 of a line in diameter, taken out of this mixture, was often sufficient to fecundate a tadpole. The ratio of the tadpole to the particles of feed diffused in this drop of water, is found to be as 106,477,777,777 to 1. The weight of the feed is 1/199,468,750 of a grain, and its bulk 1/300,212,042 of a cubic line. Differtations, v. i. § 655.

He found, however, that although a minute quantity of seminal fluid is sufficient to produce the effect, there must be contact of the gross and visible part of the fluid; that no vapor or offervium, no aura fformantia will suffice. Diff. ch. 5. § 161—170.

The feed of one species will not fecundate another; that of the water newt has no effect on the embryos of frogs and toads; nor reciprocally: neither is there any action of the seeds of frogs on toads, nor vice verfa. § 171—172.

The number of eggs is subject to much variety: it is inconsiderable in the serpents; from ten to twenty in the vipers and lizards; one or two hundred in the crocodile, according to Bartram, Travels in America; two or three hundred in the turtle; but the most numerous in the frog kind. In the toad, where the eggs are laid in a double row, forming a cord of a glutinous nature, these rows measured 43 Paris feet, and contained 1207 eggs. Spallanzani Diff. v. ii. § 45.

In the teudines, serpents, and lizards, which have a true yolk, this is to be regarded as a supply of nourishment for the young animal, whose evolution probably goes on in a manner analogous to what is observed in birds; although the process has not been actually watched, nor the order and succession of the changes observed, as in that class. Blumenbach has delineated the egg of the crocodile, with the young coming forth; the shell is flexible, as in the other amphibia, and consists of a thin, leathery, and tough, external stratum, marked throughout with extremely fine undulated lines, and lined by a more delicate smooth membrane. The recent eggs, and the young crocodiles which they contain after evolution has commenced, are eaten by various African tribes. The relation in size between the egg (about equal to that of the goose), and the full grown animal (the Nilotic species), which reaches to thirty feet in length, or even more, is at first view remarkable; and Herodotus has called the crocodile the largest animal from the smallest egg (Blumenbach's Abbildungen, No. 27.) Scba has also figured a young crocodile, with the membrane of the yolk adhering to the abdomen, as in birds. Thcaurus, t. i. pl. 104, fig. 7.

In the animals just enumerated, the eggs, whether deposited in the sand of the sea-shore, or of the banks of rivers, in the holes of trees, the chinks of walls and rocks, &c. undergo no process of incubation like those of birds, but are developed in the ordinary temperature of the atmosphere, and the young animals come forth from their confinement, differing only in size and proportions from their parents.

In the venomous serpents, and the salamanders, the caste is different. The egg containing, as in the preceding instances, the young animal, and a sufficient supply of nutriment for its growth, until it is of size to quit its original abode, is hatched in the oviduct of the mother, and the young come forth from the cloaca alive, but surrounded by their membranous coverings. The young vipers and other venomous serpents, when they are born, are freed by the mother from this kind of afterbirth.

A very curious circumstance has been observed in some of these, recalling to our minds the abdominal pouches of the marsupial mammals, and the mode in which they serve as a shelter for the young, while yet too small to shift for themselves. Palisot Beaulieu thus relates the fact we allude to. "Having perceived a rattlesnake at some distance, I approached as gently as possible, when, on lifting my hand to strike him, he founded his rattle, opened his mouth, and received into it five small serpents, about the size of a quill. I retreated and concealed myself, when the animal, thinking the danger at an end, opened his mouth, and let out his progeny. When I appeared again, they immediately took to their same retreat." He had heard this fact from American planters, and it has been since confirmed by other travellers. Daudin, Hift. Nat. des Reptiles, v. 5. p. 68.

The young of the salamander, like those of the viper, are born alive. The female brings forth very delicate oval vehicles, which may be compared to hydridas, each of which contains a perfect young salamander, an inch in length, moving its tail, and lacerating its coverings at the time of birth, and emerging in the form of a four-footed tadpole.

"In this strange animal," says Blumenbach, "I have observed a curious fact, already noticed by Wurff bain in his Salamandria poa, p. 83. viz. that a female, kept by herself, and absolutely without intercourse with any other of her kind, has produced young ones. I have kept in a glass at home, for five months, a female salamander, whose tail I had cut off, and in the mean time have had no other in the house, nor even seen one. Yet this solitary female, which, to my surprise, sustained so long a fast without growing thin, has begun within a few days to bring forth young, of which thirty-four are now before me, not only living, but very lively. This observation will lead us to two conclusions; 1st, that salamanders really copulate, and that the male does not fecundate the ova as they are discharged, like what we have described in the cafe of the water newts: 2dly, that salamanders have the same nature in this respect as liens; which, when they have been once impregnated by the cock, will lay fruitful eggs, not for a whole year, as Fabricius ab Aquapendente asserted, but, according to the most accurate researches of Renmnn (art de faire éclore les oiseaux domestiques, t. 2. § 327), for five weeks after separation from the male.

These young salamanders have a two-edged tail, broadly pinnated on each edge, excellently adapted for swimming, and furnished on each side of the neck with limbed brachial appendages like those of the tadpole, which however soon disappear, the two-edged tail being at the same time converted into a cylindrical pointed one." Specimen, &c. 34.

All the reptiles of the frog and toad kind, and the aquatic salamanders, have this remarkable peculiarity, to which nothing at all analogous has been observed in the economy of the warm-blooded classes or the fishes: viz. that they undergo a metamorphosis; and have, in their two states, not only an altogether different external form, but also important differences in many of the great internal organs. In their first state, they are little aquatic animals with tails and
and large heads; from their twirling movements of the former, and the great size of the latter, they have been called in Latin gyrim, in French tétards: the English name is tadpoles, and the German kaulquappen.

Development of the Frog.—As the spawn of frogs is deposited in ponds, ditches, or other stagnant water, the contained ova are evolved in the ordinary temperature of the atmosphere. In one species of toad, Spallanzani says, that it proceeds at 6° above freezing of Reaumur. He found that a temperature of 111° Fahrenheit, did not interfere with the subsequent evolution; that the number of tadpoles produced was much diminished after exposure to 122°; and that very few were evolved after the eggs had been immersed in water at 132°. A heat of 111° was fatal to tadpoles and frogs; although the latter bear 110° in the warm springs of Píza. (Tracts, vol. i. p. 32.) Each egg lies in the centre of a transparent spherical mass of mucilage; many of which, aggregated together, form what is called frog’s spawn. Round the eggs are two concentric membranes, of which the innermost, when pierced with a needle, discharges a fluid as limpid as water. The egg is round, and has a smooth surface, of which one hemisphere is black, and the other white. When the hot season is far advanced, the observer soon perceives the lineaments of the tadpole. The egg grows for some hours without losing its round shape: it is next elongated; the white hemisphere becomes darker, and the black changes into a longitudinal furrow, terminated by two perpendicular processes. And, as it incases in bulk as well as length, the internal circular membrane is dilated, and contains more fluid. By tracing thus the progres of the evolution, we come to perceive that these bodies are not eggs, as naturalists suppose, but real tadpoles. The furrow and the processes become longer; the supposed egg assumes a pointed figure, the whitish hemisphere dilates, and the black is incurred. The pointed part appears to be the tail of the tadpole, and the other the body. Further, the opposite end takes on the appearance of the head, in the fore part of which the form of the eyes is visible, though they are yet closed. The two processes also, by which the animal fastens itself to bodies, when it is tired of swimming, become evident, as likewise the vestige of the aperture of the mouth, and the rudiments of the gills. As the organs are further unfolded, the tadpole, which has not moved hitherto, begins to flick, and loosen its fetters; at this time it appears clearly, that the internal circular membrane is the amnios, in the liquor of which the tadpole floats; the umbilical chord at last is seen, and becomes still more visible the first day after the animal has quit its confinement. The cord is not, as in other animals, attached to the belly, but to the region of the head. (Spallanzani’s Difflerations, v. 2. § 14—16.) We take the liberty to note what is here said about the umbilical cord as a subject for further research.

The branchies are visible towards the end of the sixth day; in the course of the seventh and eighth all the tadpoles quit the viscous substance, which had been floating on the water, and which had hitherto served them for food. By the fourteenth and fifteenth days they are so much grown, that the two small but prominent eyes, an open mouth, nostrils, &c. can be distinguished. About the nineteenth and twentieth days the branchial appendages are withdrawn within the skin, and no longer visible. The heart can be seen to move, and the caudal vertebrae are recognizable. On the twenty-fourth day the front limbs, which had already existed under the integuments, appear in the place of the branchies, or rather near where they had been. In ten or twelve days more the hind limbs come out. In this state they swim about in the water, and grow. The tail gradually disappears, and in about two months after they have been hatched, they are metamorphosed into frogs. These at first are small, and then become gradually larger. Except in the case of the rana paradoxo, and the bufó fucens, in which the tadpoles become fo large, that the animal, when it has changed, is of the adult size.

Anatomy of the Tadpole.—The points in which the animal differs from the organic arrangements of its perfect state, are the large tail, which bears a very considerable proportion to the body, and is afterwards entirely lost; comparative smallness of the mouth, to the under lip of which a small organ is attached for fixing the tadpole to other objects; and a kind of horny plate for jaws; two tuberocities under the neck, which the animal can distend at pleasure; the rudiments of the lungs; the intestines convoluted in a spiral mass, which swells the abdomen, and far exceeds, in its ratio to the length of the body, the intestinal canal of the perfect animal; the branchial appendages, and the vessels connected with them; the fore limbs, situated at first under the skin. For the series of changes, and the anatomy of the young animal, see the plates of Roefel, Hill. Ranar. Nofrat.

Further particulars of the anatomy of tadpoles, and particularly of the circulatory and respiratory organs. In his “Recherches sur les Reptiles douteux,” Cuvier has entered at some length into a consideration of the anatomy of the tadpole. The following account, which is translated from his memoir, as published in the “Recueil d’Observations de Zoologie et d’Anatomie comparée, faites dans le Voyage de Humboldt et Bonpond,” v. 1. p. 195, is to be understood as applying to the full grown tadpole.

The tadpoles of frogs, tree-frogs, and toads, differ from those of salamanders, principally in having their branchies concealed: we have already observed, that in their earlier stages the branchies of the former are also external: the only way by which the water can escape from them is through two holes, formed in different situations, according to the species: there are even several which have only one hole, on the left side. Such are the tadpoles of the jackie (rana paradoxo), and of the brown toad (bufo fucus); but the tadpole of the common frog has two, both placed below.

We find, on opening the skin of a tadpole longitudinally, that the internal organs are divided into two parts, or contained in two membranous folds.

The first extends from the horny and false jaws, which form the mouth of the tadpole, to behind the branchies, enveloping the latter entirely. The other contains the abdominal viscera; it is the peritoneum, on which vestiges of the abdominal muscles are already visible.

The first sac is very thin and transparent, and penetrated, like the skin, by holes for the exit of the water from the branchies.

The latter form on each side four transverse rows of small tuft, or fringes, supported by the same number of small cartilaginous arches, which are marked on the side next to the mouth by small rounded tubercles. These cartilaginous arches are articulated on one side behind the cranium, on the other to a species of os hyoïdes, and have the same motions as in fishes. In their intervals the water can pass freely from the mouth to the branchies, to be discharged subsequently through small external apertures.

The organization of the branchies in the tadpoles of frogs is, therefore, the same as in certain fishes, for example the callionymi and others, where the water can only pass out by narrow apertures: there is, however, this difference, that
that they are not covered, either by a branchial operculum, or by radiated bones.

The branchiae, or gills, properly so called, that is, the immediate organ in which the pulmonary vessels are distributed, are small tufts formed like feathers, that is to say, fringed on the two sides. Each cartilaginous arc supports about thirty fach; and in the middle of each tuft are its two principal vessels derived from the two great blood-vessels of the arc.

It may be observed here, that the fishes called fyngnathi have also their branchiae in the form of tufts.

The heart, placed in front of this apparatus, and receiving the blood from the body by the vena cava, which comes, as in most fishes, in great part through the liver, has only one auricle and ventricle, as in fishes, and in adult frogs and salamanders, without any of those divisions which are observed in the chelonian and fœtus orders. The ventricle gives origin to a single artery, which is completely distributed on the eight branchiae, so that no drop of blood can go to the rect of the body, without having passed through the respiratory organs. All the blood which has circulated through the gills, is collected in the branchial veins, which go towards the back, and are united into a single trunk, which becomes the defending artery: but, before uniting, they furnish arteries to the head, fore feet, lung, and liver; so that in the tadpole, the lung receives blood which has been already exposed to the action of water; and this small portion of the animal's blood undergoes respiration twice, while, with respect to the great mass of the fluid, there is only one respiration, and that of an aquatic nature, or similar to the respiration of fishes.

Great changes take place when the tadpole becomes a frog; but they are produced by very simple means. As the arms and head increase in size, their arteries are enlarged; the branchiae, on the contrary, are obliterated, and their arteries are gradually reduced: but, as it is always necessary that blood should go to the head and other parts, one of the four principal branchial arteries on each side is enlarged, and serves to convey it. Then the artery, which goes out of the heart, and was formerly divided into eight branches, is now simply bifurcated, and its two branches supply the arterial trunks of the head, arms, lungs, &c.; and lastly, are united to form the descending aorta. Now this is precisely the circulation of the frog, in order to produce which it has been merely necessary to obliterate fix of the branchial arteries of the tadpole, and to enlarge the two others. Henceforward the lungs are the exclusive seat of respiration, receiving, however, at each pulsation, only a small portion of the whole mass: the frog, therefore, is now an aerial animal in respect to its breathing.

While these changes are going on in the respiratory organs, several others are taking place in different parts of the body. The narrow horny bill, preceded by small fleshy lips, falls off, and its mucus ceases to disfigure; the jaws grow hard, and form a much more ample mouth.

The eyes, disengaged from that skin, which only allowed them to appear through a transparent skull, are now seen with their complicated apparatus of three eyelids.

The fore-feet, which had been concealed between the bag enclosing the branchiae and the peritoneum, appear externally by the hind-legs growing every day larger; and the legs, formed by the many muscular flaps, and supplied by rich numerous vessels and nerves, begins to disfigure. The interlumina, formerly of nearly uniform size throughout, excessively long and arranged in a spiral mass, become shorter, and are dilated at proper parts to form a stomach and cæcum.

Among these changes, which convert the tadpole into a frog, we cannot enumerate the appearance of the generative organs. The tadpole already possesses testicle, ovaries, and their fatty appendages; and if these parts are not so large as in the frog at the season of reproduction, they approach nearly to their size at other times of the year.

What we have just said concerning the tadpole of the frog is equally applicable to that of the toad; but the different species exhibit considerable varieties in the epocha and the size at which the change occurs, as well as in the rapidity of the change. The jackie (nana paradoxa) loses its tail very late, and long after its branchiae; while the latter do not entirely disappear until it has reached the full size of its perfect state: the pipa, on the contrary, loses both very early, and while it is still very small. The species which lose their branchiae late, are larger in the tadpole than in the perfect state, because these supernumerary organs swell out the front of the body, while the tail prolongs it behind. They seem, therefore, to become smaller under their metamorphosis, and grow no more when they have become frogs. On the other hand, those whose tails and branchiae early, have still a long time to grow, and may be seen of all sizes in the perfect state. This has given rise to the mistaken notion that the jackie is changed into a fish; the tadpoles being larger than the adult frogs, it was thought possible that the latter could be the second state.

We might reftore to the larvae of the salamanders the name of cordylus, which they bore among the Greeks, according to the remark of Schneider. They ought not at least to have that of tadpole (tétard), because they have not a large head, their branchiae not being concealed under considerate coverings, but floating loosely on the exterior of the body. They are tufts arranged like the teeth of combs, simply fleshy or membranous, and attached by pedicles, which allow them to float loosely in the water. The cartilaginous arcs of the sides merely serve to limit the small apertures through which the water paffes out of the mouth: for, although the form and arrangement of the tufts seem to expose them sufficiently to the action of water, there are still openings from the mouth, enabling the animal to establish a current of the fluid. In other respects, the circulation is carried on as in the branchiae of the tadpoles of frogs, and it undergoes the same changes when the branchiae are obliterated.

The larvae of salamanders, observed by Cuvier, had the same species as the adult animals, and possessed no hornv bill, although their branchiae were still very complete. He therefore concludes, that in this respect, as well as in their feet, and in the organization and permanence of their tail, there is a much more close resemblance between these larvae and the adult salamanders, than between tadpoles and frogs.

These remarks on the anatomy of the tadpole, and of the larvae of salamanders, are illustrated by four figures in the 14th plate of the work quoted above. Figs. 1, 2, and 3 represent the anatomy of the tadpole of the bufco fuscus; and fig. 4, that of the larva of the salamandra aquatica.

The co-existence in the same animal of branchiae and lungs, that is, of organs calculated for breathing air, and of those which are fitted to extract air from the water, is not peculiar to the larva of frogs and salamanders; it is observed also in the frogs lacertina and the proteus aquamarinus, the last two animals whose construction is in many respects so singular, that the opinions of naturalists concerning them have been long extremely unsettled. Many have supposed them to be the larva of some large reptiles, for which opinion,
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other circumstances in their organization and habits, besides the pollution of branchiae and lungs, have been added as arguments. Others have contended that they are perfect animals; and the more exact researches of modern naturalists and anatomists seem to have finally proved that this is the case. The anatomical details, by which this conclusion is supported, will be found towards the end of the article.

As the firen and proteus, truly perfect animals, have been sometimes confounded as larve or imperfect states of unknown reptiles, so the contrary error has been committed, of describing the larve of known species as perfect animals allied to the firen and proteus. Laurenti, one of the first naturalists who endeavored to reduce the clas of reptiles to regular order, established a genus (proteus) for such batracian reptiles as, according to him, possessed both branchie and lungs. To this genus he has assigned the tadpole of the rana paradoxa, under the name of proteus ranae; and another, which he himself inspected, and which has since been ascertained to be the larve of an aquatic salamander, under that of proteus tritonius. (See his Specimen medicae exhibens synopse reptilium.)

The firen operculata of M. de Beauvois (Transactions of the Philosophical Society of Philadelphia, vol. iv.) is considered by Cuvier as a similar instance, and perhaps as the very axolotl or Mexican animal, which will be described presently. He regards, in the same light, a animal described by the very learned writer on amphibia, Mr. Schneider, as found in the lake Champlain: see Hill. Amphib. Nat. et Litter. 1788, p. 50. He says it may be objected that we cannot easily conceive that so complicated an apparatus as that of the branchie, their cartilaginous arches, and the muscles moving them, should disappear and leave no trace behind; but, as the larve of our salamanders experience such a change, the singularity of the phenomenon cannot be pleaded as an objection to it.

Recherches, &c. p. 117.

Anatomy of the Axolotl, or Large Mexican Salamandrine Tadpole.—Another animal of this kind is one found very commonly in the lake surrounding the city of Mexico, and noticed by the early writers in their accounts of those countries, and of the interesting objects they produce, although not methodically described or scientifically investigated until very lately. Hernandez speaks of it in two places; in one, under the name of the eatalle tadpole (gyrinus edulis), or axolotl (Hill. Anim. Miner. Nov. Hilp. lib. unci. Tract. 5. cap. 4. p. 77; this book is placed at the end of the abridgment by Recchi); in the other, under that of hufus aquarum, plicis lucidus, or axolotl (ibid. cap. 2. p. 76, and in the large abridgment by Recchi of the whole work of Hernandez, lib. 60. cap. 4. p. 316.). This account, accompanied by a figure of some other animal, was copied into other works with various errors.

Dr. Shaw described an individual sent immediately from Mexico to the British Museum, and gave two good figures of it; in the Naturalist’s Miscellany, N° 343. under the name of gyris mexicanus; and in the General Zoology, vol. 3. pt. 2. pag. 612. pl. 140, under that of siren pliciformis, confidering it as allied to the genus siren.

Mr. de Humboldt met with it in Mexico, and recognized it as the axolotl of the Mexicans and first Spaniards, under which name it is still known. He brought specimens of it to Europe, and entrusted their anatomical investigation to the experienced hand and profound judgment of Cuvier, whose description we extract from the Recherches fur les Reptiles douteux, already quoted, pag. 109. et seq. pl. 12.

Anatomy of the Axolotl.—In its size and general configuration it very closely resembles the salamander terrestrial (lacerca salamandra) of Europe. No one would hesitate in calling it a salamander, were it not for the branchie, which latter resemble very narrowly those of the larve of salamanders, and float loosely at the sides of the neck.

The openings communicating with the mouth are four in number, and much larger than in the firen. A fold of the skin of the head forms a species of operculum for the four. There are four arches, as in fishes, and we should hence expect five openings, but the fourth is immediately united to the trunk. The two intermediate archee have, towards the mouth, two rows of pointed denticuli; but the first and fourth poiffes, each, only a single row. None of these denticuli exist towards the operculum, so that the first of the four openings is not denticulated in any direction.

Each of the four arches has, towards the outside, a sharp membranous cri{t}a, which might deceive super{icial} obse{vation} by causing a resemblance to the gills of a fish; but there is no visible net-work for respiration, and the arterial trunks follow, without any division, the three first arches to arrive at the branchial tufts, which are the only true gills. There are three of these tufts on each side, attached to the three first arches, where the skin joins them together; the operculum and the fourth arch have none. These tufts are much more ramified than those of the firen, but their ramifications resemble a lock of hair, and are not arranged with so much regularity.

Osteology.—The head is the same as in the salamanders, except that the cranium is rather broader. The teeth are placed in the same way on the edges of the jaws; there are moreover two plates immediately behind the edge of the upper jaw; but the two longitudinal series, which are observed along the palate of the European salamanders, could not be perceived. The head is articulated in the atlas by two condyles, as in the firen and salamanders.

The apparatus for supporting the branchie is very similar to that of the firen; and, at the time of the metamorphosis, a part of it probably remains to form the os hyoideum of the salamander. The middle piece is cylindrical, short, and terminated behind by a forked extremity. The front end supports two cartilages, the ends of which, suspended to the angles of the jaw, correspond to the hyoideal branches of fish; they are immediately under the membranous operculum. From the posterior end of this middle piece proceed two other branches on each side; a broad one supporting the first cartilagineous arch, and a more slender one trifurcated to support the three other arches. The four branchial arches are bound, by their outer extremities, to the first vertebrae.

There are seventeen vertebrae from the head to the pelvis; and twenty-three from the latter to the end of the tail. The spinous processes of both are longer than those of the salamander; and they exist on both aspects of the caudal vertebrae, which makes the vertical measurement of this part exceed that of the European aquatic salamanders.

There are thirteen small ribs on each side, similar to those of the salamander. The osteology of the limbs resembles in all respects that of the salamander, excepting the more pointed form of the lateral phalanges, which has occasioned them to be taken for nails.

Organs of Sense.—The eye is smaller in proportion than in European salamanders; but not smaller than that of the species brought from the Alleghany mountains by Michaux.

Organ of Circulation.—The vena cava receives the termination of the veins of the head; of the branchie, and their arches; of the lungs; of the fore-feet; lastly, of the inferior vena cava, which has traversed the liver, and received, as usual,
The blood of the vena portarum. It enters a large and single auricle; there is also a single ventricle, giving origin to a large muscular artery, similar in all points to that of fishes, of the furen, and of tadpoles. It produces for the branchie three arteries on each side, which proceed, as we have already mentioned, along the three first arches. The branchial veins are quickly united behind into a single trunk, under the back of the head, and this vessel, following the direction of the spine, becomes the great artery of the body. This is the circulation of the batarian larvae; and the axolotl, being larger than any of the European species, offers a convenient opportunity of examining this kind of arrangement in the circulating organs.

Organs of Respiration.—The branchiae of the axolotl, exhibiting on a larger scale the same motions as those of the falamandrine larvae, the mechanism can be better understood; and the following description of the muscles will, therefore, be received with interest.

Each of the cartilages analogous to the hyoidal branches has a very strong muscle, defending from the basis of the skull along their convex sides to their inferior extremities. These muscles open the branchial arches, by separating their inferior extremities from the palate.

The arches are approximated by a muscle fixed behind to the inferior extremity of the larynx, advanced over that of the three others, and giving a pitch to each. Its antagonist is a small muscle, fixed, on one side, to the inferior extremity of the hyoidal branches; and proceeding backwards as far as under the first branchial arch, to which it is attached, opposite to the pitch of the preceding.

The os hyoides is carried forwards by two genio-hyoides, and backwards by two pubio-hyoides; which latter supply the place, as in the falamandres, both of the sterno-hyoides and refti abdominis. It is elevated by a muscle similar to the mylo-hyoides of the fane animals.

Lastly, the three tufts are themselves elevated and defpelled by as many pairs of muscles, which are attached above and below to the convexities of the branchial arches, and have their other fixed points in the bases of the tufts.

The lungs are two large bags, on the internal surface of which the blood-vessels form a loofe but very conspicuous net-work. There are no cells. They open into a common, membraneous, opaque, and tolerably wide canal, supplying the place of trachae, but unfurnished with cartilaginous rings, and contracted to form a small larva with two membraneous lips. The glottis is small, formed by two membraneous projections, behind each of which is a small hollow or ventricle, which may be supposed to produce a more powerful voice than that of the firen.

Organs of Digestion.—The tongue poffeffes but little power of motion; it is free in front, but fixed behind to the anterior extremity of the os hyoides.

The cæsophagus is short, folded longitudinally, and continuous with the stomach, which is large and membraneous, but considerably narrowed, and more muscular towards the pylorus. It was filled, in the two individuals from which this description was drawn up, with fresh-water cray-fifts, like the European, which had been swallowed without maitication, so that entire limbs were found even in the rectum.

The intestinal canal is tolerably large, particularly behind, and of moderate length. It makes two principal folds, and has neither cæcum nor any internal valve. The liver is rectangular, without any deep notches; no gall-bladder was observed. There is a small spleen in the centre of the meftentery, which is simple, as usual.

All these intestines are like those of the falamander.

Generative Organ. — The ovaries, small, flaccid, and hardly containing visible ova, resemble, in their situation and fatty appendices, those of the falamander. The oviducts were fo delicate, that they could scarcely be seen.

From all the circumstances just detailed, and from the close resemblance of all its organs to those of falamanders, and their larvae, we may conclude, that the Mexican axolotl, or firen pliciformis of Shaw, is the larva of some fane falamander.

Growth.—The age of puberty seems to be the limit of growth in many of this clafs, as in birds, and we may almost lay, in all mammalia. But others, particularly the crocodiles, turtles, and serpents, grow constantly; of which continual increase the whales ferve to afford an example among mammalia; at leaft, no limits can at present be assigned to their stature. We know little about the length of life of the amphibia. Many, particularly the tortoizes, serpents, and crocodiles, are prodigiously long-lived; coming forth originally from an egg, which is very small in comparison to their future stature, growing very slowly, and reaching an immense fize. Niebuhr law at Surat a tortoise 125 years old.

Organs of the Animal Funetions.

Organs of Motion. Description of the Bones.—We know of nothing peculiar in the organisation of the bony substance of reptiles. In the larger species, the bones polife as much fmirn as in the mammalia; but in the smaller, as the frogs for example, they are more cartilaginous. Cuvier flates, in general, that the bones of reptiles contain more gelatine than those of the mammalia. Caldefi afferts, that there are no medullary cavities in the tortoise; according to Cuvier, there are confiderable ones in the crocodiles. Lécons d’Anat. Comp. tom. i. p. 110. They have never been feen tinged with madder.

The Head.—A very diminutive cranium, and enormous jaw, make up the head in this clafs.

As the brain of reptiles and fishes occupies only a small part of the cavity of this cranium, no important consequences can be deduced from its shape and fize. In the tortoise, this cavity is large, narrow from right to left, elevated anteriorly and defpelled posteriorly. Its lateral parietes are almost vertical, and its bafe is parallel to the palate. The external form of the head, and its apparent magnitude, are occasioned by the acelfory bones, between which and the cranium there is a large space occupied by muscles and glands. The greatest part of the skull is occupied by the large lateral hollows, holding the eye, and the powerful muscles, that move the lower jaw.

The small size of the cavity of the cranium, with respect to the external bulk of the head, is fill more extraordinary in the crocodile. In an individual four metres long (between thirteen and fourteen feet), that cavity will hardly admit the thumb, and the area of the fection of the cranium is not one-twentieth part of that of the whole head. (See a fection of the skull of a crocodile in the Annales du Muséum, tom. x. pl. 4. fig. 5.) The length of the cranium is not one-fifth of the length of the head in the galliades (longiroftres, Cuvier); and it is less than one-fourth in the alligators or caimans (alligators, Cuv.), and in the true crocodile (crocodiles, Cuv.) The figure of the fection is oblong, rather larger anteriorly, and defpelling posteriorly. There is a confiderable defpension for the ptanitary gland. Its breadth is equal to its height; and the lateral parts of the head, as in the tortoise, cover only the temporal foffe.

The relative fize of the cranium and jaws undergoes a very remarkable change, in proportion to the gradual development of the crocodile. The head, when it comes out of the shell, is thick and rounded, and the forehead prominent; see Seba.
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Seba, 'Thesaurus, tom. i. pl. 104, figs. 3 and 6; and Blumenbach's Abbildungen, N. 27. The eyes are now equidistant from the end of the snout, and the posterior extremity of the head; of which the cranium forms nearly one-third. When we look at the adult animal, we are astonished to find the frontal prominence gone, leaving the head quite flat, and the jaws so elongated, that the eyes are three times farther from the end of the snout than from the back of the head; and the proportion of the face to the cranium is 20 instead of 3 to 1. Geoffroy St. Hilaire in the Ann. du Mus. vol. x. p. 77.

The crocodile exhibits also a great disproportion between the cranium and the rest of the head. Its brain, according to the description of the Parisian dissectors, does not seem larger than a pea; and the remainder of the head, which is of considerable size, consists of the large maxillary bones, the orbits, and immense temporal fossae, which, not being separated by any partition, give the cranium a very singular appearance. Description Anat. d'un Cameleon, &c.; or Blaffi Anat. Anim. vol. i. p. 14.

The cranium of frogs and salamanders is almost prismatic.

The French naturalists have furnished excellent descriptions and engravings of the heads of various crocodiles. It will be as well for us to enumerate here the sources of information concerning the osteology of this animal altogether, and to give a few references to good figures of the skeletons of other reptiles.

There are tolerably good representations of the crocodile's skull (the East Indian) in Geer's Museum Societis Regiae, and in Faujas St. Fond, Histoire de la Montagne de St. Pierre de Maestricht, pl. 41. The head of the crocodile of the Nile (croc. vulgaris, Cuvier), is figured by Geoffroy in the Annales du Musèum, vol. ii. pl. 57, fig. 2. In pl. 4, vol. 10. of the same work are four figures of the skull to illustrate a paper of Geoffroy St. Hilaire, entitled "Détermination des Pièces qui composent le Crâne des Crocodiles," and pl. 1, of the same volume, contains nineteen figures of the heads of various crocodiles in different views, to illustrate Cuvier's paper "Sur les différentes Espèces de Crocodiles vivans & sur leurs Caractères distinctifs." In the 12th volume of the Annales, Cuvier has given his "Observations sur l'Osteologie des Crocodiles vivans," with two plates, in which most of the bones are carefully figured. For the skeleton of the tupinambis, see Cuvier, Leçons, v. 5. pl. 3.; of frogs, Reelfd, Historia Ranae Notolatrum; of the salamander, Latreille, Hist. des Salamandres de France; of the totoile, salamander, frog, cameleon, lizard, and a serpent, Daudin, Hist. Nat. des Reptiles, vol. i.; of the proteus, firen, and Mexican axolotl, Humboldt, Recueil d'Observ. de Zooll. &c. t. 1; of the totoile, Blatti Anatomia Animalium; Cuvier, fur les olémens fossiles; and Geoffroy St. Hilaire, fur les tortues mollas, in the Annales du Musèum, vol. 14. The skeleton of the totoile is also figured in Cheffelden's Osteology; in Coiter's Lectiones Fallopii de Partibus Familia Rhus, fol. Norib. 1775; and in J. D. Meyer's Zeitvertreib mit Betrachtung curiose Vorrichtungen allerhand Thiere. t. 1. tab. 29, 31; t. 2. tab. 62; and the separate parts in Caldeni ossificationes anatomicae intorno alle Tartarughe. Firenze, 1687.

The skeleton of the common green lizard may be seen in Coiter, pl. 4; in Meyer, t. 1. pl. 56; that of the salamander and water newt, and of several snakes in Meyer: that of the cameleon is prefixed to Cheffelden's 6th ch. Schneider has figured that of the rana pipa in his Histoire Animal. Amphib. faulzcc, t.

For the form of the head in the different species, a point belonging rather to natural history than comparative anatomy, we must refer to the figures already quoted. The surface is more or less rugous in different specimens; and in many very considerably so; these differences are specific, only where individuals of the same age are compared, for the rugosities increase in size and prominence in each species with the increase of years. The bony substance is often perforated by many small holes, as if it were carious or worm-eaten. The features are constant; they are not effaced in the oldest heads observed by Cuvier.

The cranium.—The cranium of the crocodile, viewed from behind, has the form of a very irregular truncated pyramid; of which the point or narrowest portion is downwards, and the base excavated to lodge the brain, is upwards. This pyramid has three surfaces, one posterior, which forms the occiput, and two lateral. The occipital surface is almost triangular; one of the angles (the apex of the pyramid) is inferior, the other two are superior, and greatly prolonged backwards and to the side, in order to form the enormous articular processes, which receive the lower jaw. Their position is almost horizontal. The foramen magnum is situated in the middle of this surface, and under it the single condyle for articulating the head with the vertebral column.

The future depart from the foramen magnum, which divide the occiput into particular bones. The superior part of the cranium is formed by a single parietal bone. Anterior to it there is an os frontis, also single, which forms the roof of the orbits.

The orbit magnus are situated on each side of the parietal bone, and are partly supported by the articular processes for the lower jaw, already mentioned.

A small arch on each side, different from the zygoma, leaves between it and the parietal bone a large round hole, which perforates the temporal fossa. The arch is partly formed by a process of the os temporale, and partly by a particular bone articulated to the junction of the parietal and frontal. The particular bone occupies the place of the post-orbital process of the os frontis in the mammalia; for it extends behind the orbit to join the cheek-bone; and with it finishes the frame of the orbits.

The unusual configuration of the whole head in the crocodile necessarily involves very extraordinary modifications of the individual bones, which it is in many cases exceedingly difficult to refer to their corresponding ones in the crania of the mammalia. For a more minute account of this matter, which could not be easily understood without plates, we refer to the memoirs and engravings, already quoted, of Geoffroy and Cuvier.

A cranium similar to this of the crocodile, is found in the other lizards, notwithstanding the great differences in the form, proportion, and the direction of the parts. In the cameleon, therefore, the foramina, by which the temporal fossa communicate with the cranium, are fo large, and the bony edges which form them fo thin, that the latter represent three slender branches rising to support the kind of helmet which distinguishes this animal. The articular processes are not directed backwards, but downwards.

The Jad peculiarity is also observed in the other lizards, but they have not the crests of the cameleon, and the upper part of their cranium is broad, like the crocodile.

In frogs and salamanders the cranium is nearly of a cylindrical form, flat superiorly, and enlarged posteriorly; the frontal bones have the shape of an elongated rectangle, and occupy the interval of the orbits. The Surinam toad has the cranium much flatter than the other genera.

The eminences intended to affix in the articulation of the jaw are turned directly towards the sides.
The structure of the cranium of tortoises bears more resemblance to that of crocodiles than of frogs. The frontal bones form only the roof of the orbits, and the cranium does not pass between these cavities. They are very short, and the parietalia are three times longer. The latter are not confined to covering the cranium. They extend on each side, and form an arch over the temporal fossa. In the sea tortoises this arch is completed by two peculiar bones, which extend from the os parietale to the zygoma, and the anterior of which bounds the orbit behind.

The articulare processes are directed downward, as in the camel. Above these and the maxutus auditi, we find considerable auditory processes, which are pointed superiorly in land tortoises, but are rounded and marked by a longitudinal furrow in the sea tortoises.

Serpents have two frontal bones almost square, and a single parietal bone. Their cranium advances forward between the orbits, as in frogs. The occipital bone has a process directed backward, and connected with a particular moveable bone, analogous to the square bones of birds, to which the lower jaw, and the arches which form the upper, are articulated.

The general form of the cavity of the cranium of reptiles is oblong, and almost of an equal breadth, being merely a little contracted between the ears. The tortoise has a kind of fossa turcica, the four clinoid processes of which are directed forward. The sphenoidal fossa is somewhat depreessed in the serpents, but it has no clinoid processes. It is a semi-lunar depression, the plane of which is situated from before backward.

The basilar fossa is lower than the other fossae in the crocodile, and in some tortoises.

Foramina of the Cranium.—The interior part of the cranium is frequently not closed by ossification in reptiles and fishes, and the olfactory nerves pass through a large vacant space, which is not subdivided into particular holes. This at least is the case with the camel. The, the iguana, tortoises, the pike, the anarrhichas, &c. In others, the olfactory hole is contracted, but still simple, as in the crocodile. It is double in frogs and salamanders. The rays and the flanks have also two holes, which are considerably removed from each other.

The optic holes are likewise sometimes united into one, as in the crocodile: those of the tortoise are much removed from each other, and are distinguished from the great hole in the front of the cranium, by only a small bony partition. The structure of the cranium in the pike is similar. In the frogs, the rays, the anarrhichas, and it should seem in the greater number of fishes, the optic holes are at a great distance from each other, and perforate the sides of the cranium. These animals have no sphenoid-ocular fissure, and the small nerves transmittted to the eyes pass each through a particular foramen.

There is, in general, only one hole on each side for the three branches of the fifth pair of nerves, which, therefore, supplies the place of the foramen rotundum, foramen ovale, and in part of the sphenoid-ocular fissure. This hole, however, is divided into three in the carps.

The meatus auditurium internus exits in reptiles.

The Face.—In the crocodile the face resembles one-half of a cone irregularly flattened on its convex surface. It is chiefly formed by two osa maxillaria, and two osa nasi, which are situated almost parallel to each other, and two osa intermaxillaria, which form the end of the muzzle, and surround the aperture of the nose like a ring.

The bones analogous to the lacrymalia are four in number, two on each side. The os nare, which is very large, after forming the inferior, and affording a small process to the posterior edge of the orbit, extends directly backwards to join the great maxilla and proboscis: thus the temporal fossa has no communication outwardly, except by a hole which is smaller than the orbit, and the greater part of which is covered by these bones, as by an arch.

The nasal fossa are continued in a long and narrow tube under the foramen magnum. They perforate the os palato-maxillare, and a particular bone which is analogous to the pterygoid processes of the os phehoides. This bone is situated almost directly under the cranium, and is enlarged on each side until it forms a kind of square and almost horizontal wing. An osseous branch unites it laterally to the os maxillare and os male, in such a manner that a large hole is left on each side of the arch of the palate.

In the camel the face is concave superiorly, and bordered by a serrated ridge throughout the whole of its circumference. We observe two holes which communicate with the orbits, and two other oval foramina, which correspond to the incisive holes in the palatine surface. The bones which compose the face are nearly the same as those of the crocodile. The other lizards exhibit still less difference.

The frog and the salamander have the nasal and intermaxillary bones very short, and broader than long, which renders their face round anteriorly. The os maxillare is very narrow, and is scarcely contracted in forming the zygomatic arch. The orbits are large, but have no inferior surface, and therefore communicate with the palatine fossa. The os palati form the anterior edge of the orbital fossa inferiorly. They resemble portions of a circle. They are furnished with pointed teeth on their circumference. The canal of the naris is very short in the salamander. There is only a sphenoidal hole in the frog.

The face of the Surinam toad is very flat, but the bones are the same as in the frog. The orbital fossae are oval, and no aperture similar to the canal of the naris can be distinguished.

The face of serpents is rounded nearly in the same manner as that of lizards. Between the os frontis and os maxillare there is a particular bone which terminates the frame of the orbit posteriory. These animals have no os male. We can, however, easily distinguish two osa nasi, two osa maxillaria superiora, two osa intermaxillaria, and some analogous to the palatine arches of birds, which are furnished with teeth, and which are articulated to the bone which supplies the place of the os quadratum, with respect to the lower jaw. Two particular bones unite these arches to the maxillaria superiora.

In those that have teeth, or poisonous hooks, as the viper, the rattlesnake, &c. there are besides two small peculiar bones, articulated and moveable, which support those teeth. They are situated upon the intermaxillary bones and the anterior extremity of the osseous branch, which joins the superior maxillary bone to the arch of the palate.

The face of the tortoise is circular before, and rounded on every side. It is composed of nearly the same bones as that of the crocodile. The intermaxillary bones are, at a very early period, consolidated with those of the upper jaw. The bones analogous to the os male are three in number, one articulates with the os temporo-maxillare, and the two others; it is situated posteriorly, and forms the zygomatic arch. The other two portions are received on its anterior extremity; one extends upwards, and unites with the orbital angle of the os frontis; the other is directed downward.
downward, and articulates with the posterior and external processes of the os maxillare superius. The ossa palatae are broad, and form the posterior arch of the nasal fossa.

The borders of the face of tortoises commonly cover each other at their edges, which are refined into thin laminae. It is therefore very difficult to distinguish the futures.

In the sea tortoises the temporal fossae, which are very deep, are covered by an odontoid lamina, which forms a very solid arch above them.

The description of the jaws, and the temporal fossa, is given at the beginning of the account of the digestive organs.

Cavities of the Face.—1. Nasal Cavity. It is a broad space in the tortoises, occupying the whole thickness of the front in front of the eyes, and very short from before backwards. Its front opening is large, and nearly square, with its plane but little inclined; surrounded by fix bones. There are two round openings behind, corresponding nearly to the middle of the palate.

In the crocodile it is a long and narrow canal, extending from the end of the nose under the occiput. Its bony opening, formed entirely in the two intermaxillary bones, is turned upwards.

Other lizards have the nasal apertures situated nearly as in birds: that is, the front or outer on the side of the snout, and the back or inner in the middle of the palate. They are still shorter in the frogs.

2. The orbit is never separated from the temporal fossa in reptiles by a partition, but merely by a bony branch; and even this is complete only in the lizards and tortoises, not in the frogs, salamanders, or serpents. The plane of its margin is lateral in the tortoises, serpents, andカメleon; it is more or less directed upwards in the crocodile, salamanders, and frogs. The figure varies from circular to triangular. The inferior surface or floor is never complete: either it is altogether deficient, or it is perforated by a very large aperture. The same remarks are applicable to the inter-orbitar septum.

The zygomatic fossae are spoken of in the description of the jaws and their movements, under the division of Organs of the Vital Functions.

Foramina of the Face.—Where there is no distinction between the orbit, and temporal fossa, the sphenomaxillary fissure is of course wanting. There are no internal orbital holes, as the relation between the orbits and nose is altogether different from what is observed in the mammalia.

The crocodile, frog, and salamander, possess a large foramen incisivum. The tortoise has two small ones: the structure of the lizards is not known.

There is no suborbital opening, reptiles having no lips to receive the artery and nerve, which it transmits in the mammalia.

The sphenopalatine canal appears as a simple hole in the os palati.

Motions of the Head.—The articulation of the head of reptiles is considerably behind, but the motions vary in different species.

In the crocodile there is only one condyle, situated at the under side of the foramen magnum: the atlas is formed of two portions; the posterior is shaped like the segment of a ring; the anterior, which is thicker, receives the condyle, and is articulated to the second vertebra; there are two lateral processes, long, flat, and turned backward, which supply the place of transverse processes.

The odontoid processes of the second vertebra are short and thick; it is articulated within a cavity in the body of the atlas. This second vertebra has transverse processes similar to those of the first.

All other lizards have nearly the same conformation; but the condyle seems divided in two by a longitudinal superciliary furrow.

The tortoises have likewise only one condyle. In the land fort it is prolonged, and divided into two, as it is in the lizards. In the marine species it presents three articular faces, like a trefoil leaf. As this condyle penetrates deep into the correspondent cavity of the atlas, the lateral inclination of the head is much confined. The other motions of the head of the tortoise are those of projection and retraction: they depend upon the flexion and extension of the cervical vertebra.

The frog, the toad, and the salamander, have the head articulated by two condyles upon the first vertebra, which is almost immovable.

Serpents have three surfaces, in the manner of a trefoil, close together, upon one condyle, beneath the occipital foramen. The head is not more movable on the atlas, than the rest of the vertebrae are upon each other.

Bones of the Spine.—The number of vertebrae, and every other attribute of the spine, are more varied in this class of animals than in any other.

In the tortoises, seven vertebrae are attached to the neck: the first is only a single tubercle, the annular portion of which is very distinct. The surface, by which it is articulated with the head, is formed of three planes: one anterior, and two lateral. The point in which they unite is the most prominent, and to this is attached a strong ligament. The surface which unites it to the next vertebra is a glenoid cavity; the second and the following vertebrae have a prominent longitudinal ridge upon the forepart of their body. The articular processes which descend below the body there are no spinal processes, except one to the second vertebra, which points forward, and one to the third in the form of a simple tubercle. The two last vertebrae, at a certain age, become anchyloosed. There are eight dorsal vertebrae; but they are all anchyloosed, together with the ribs and the back-shear, in one immoveable piece. They have, therefore, neither processes nor articular surfaces: they are all narrower in the middle than at the ends. The lumbar and facial vertebrae are likewise consolidated with the back-shear, but those of the tail are free and moveable. The condyle, which forms the body of these vertebrae at its articulation with the others, inclines backward, and not towards the head, as those of the neck do. There are likewise upon the fore-part of the body, at its base, two small tubercles; but all the processes of these vertebrae resemble those of the mammalia.

In the family of lizards, the crocodile has seven cervical vertebrae, distinct indeed, but so closely articulated as not to be moveable. The processes are too numerous, long, and close, that the animal cannot bend its neck, and the cervical column may, therefore, be regarded as a single piece. This correspondence with the reports of travellers, that the crocodile is unable to turn its head round. The anterior surface of the body is concave, and the posterior convex, throughout the vertebral column of the crocodile. The atlas is composed of five pieces, which appear to continue separate through life. The vertebra dentata has five only. The other cervical vertebrae have on each side two short transverse processes, which serve to support the small ribs or appendices, which limit the flexion of the neck. Each has two pedicles, attached to the two processes thus mentioned: the appendix projects into a sharp procere before and behind, which touch those of the contiguous vertebrae. The five
five first dorsal vertebrae have a lateral tubercle for the head of the rib, and another on the transverse process for its tubercle; thus the rib is articulated only to one vertebra. But the first of these articular surfaces is wanting in the remaining ribs, while each of their transverse processes has two articular faces. The same number (seven) is found in most lizards, though the camelion has only two. The visceral vertebrae are very few in every species, and none of them have a large os facrum.

As frogs have no ribs, no distinction can be formed with respect to the three first orders of vertebrae in them. They have in general eight between the neck and the pelvis, all furnished with pretty long transverse processes. The last are the longest, and touch the os illii. In the toads, the transverse processes are very large, and shaped like hatchet blades. The os facrum consists of a single bone only; it is long, pointed, compressed, and has no coccyx. In the pipa, which has the transverse processes of the second and third vertebra much longer than the others and almost like ribs, this bone is ossified with the last vertebra.

The salamanders have fourteen vertebrae between the head and the facrum; they have all nearly the same shape, except the first, which receives the head, and the last, which is articulated to the facrum. The two extremities of the spine alone want the velliges of the ribs, which consist of small oblong moveable bones, actually articulated to the transverse processes, which here take a posterior direction. The articular processes are large, and wedged together. The posterior rest upon the anterior, so as to impede the motion of the spine backward. The facrum consists only of a single vertebra, but there are twenty-five in the tail.

In serpents, the vertebrae alone constitute almost the whole skeleton. It appears in general, says Blumenbach, that the number of vertebrae, in red-blooded animals, is in an inverse proportion with the size and strength of their external organs of motion. Serpents, therefore, which entirely want these organs, have a most numerous vertebrae; sometimes more than three hundred. (Comp. Anat. p. 118.) In confirmation of this remark, we may observe how numerous the vertebrae are in the elongated fishes, as the eel, and in the whales, as the porpoise, (above one hundred in the former, and between sixty and seventy in the latter).

Birds, whose wings give them such vast power of locomotion, have very few vertebrae, if we consider the ankylophied ones as forming a single piece; and the frog, with its immense hind extremities, has a very short spine, consisting of few or few pieces; and that of birds. The vertebrae of this order are nearly of the same form, from the head to the tail: the body, as well as the spinous, articular, and transverse processes, are easily distinguished. In certain kinds, for instance the boa, the spinous processes, which are continued throughout the whole length of the back, are separated from each other, and allow reciprocally a motion sufficiently conspicuous. Wherever this disposition of the spinous processes prevails, the body of the vertebra, on the side next the belly, presents only an obscure projecting line. In other kinds of serpents, as for example the rattle-snake, the spinous processes are long, and so large as to touch each other. They have, for their base, the articular processes, which lie on each other like tiles. In consequence of this structure, the motion of the spine towards the back is very circumfered, but its motion towards the belly and sides much augmented. The bodies of the vertebrae play very easily in these directions upon one another, and are armed with a sharp spine tending towards the tail, which only obstructs their motion when it might produce a luxation. The first vertebrae differ from those of the rest of the body, only in having the rudiments of the ribs much smaller: there is no neck in these animals. The vertebrae of the tail differ no farther than in having no ribs, and that their spines, both ventral and dorsal, are double, or form two ranges of tubercles. The articulation of the bodies of the vertebrae with each other is very remarkable: the anterior part of the body of the vertebra presents a smooth hemispherical tubercle, and the posterior part a corresponding cavity; so that each vertebra becomes connected to those next it by a sort of knee-joint. This mode of articulation fully explains the motion of reptiles, which is performed winding from side to side, and not up and down, as it is represented by painters.

### Table of the Number of the Vertebrae in Reptiles.

#### I. Oviparous Quadrupeds.

<table>
<thead>
<tr>
<th>Species</th>
<th>Vertebra of the Neck</th>
<th>Vertebra of the Body</th>
<th>Vertebra of the Sacrum</th>
<th>Vertebra of the Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turtle</td>
<td>- 7</td>
<td>- 14</td>
<td>- 0</td>
<td>- 3</td>
</tr>
<tr>
<td>Crocodile</td>
<td>- 7</td>
<td>- 12</td>
<td>- 5</td>
<td>- 3</td>
</tr>
<tr>
<td>Tupinambis</td>
<td>- 7</td>
<td>- 18</td>
<td>- 4</td>
<td>- 2</td>
</tr>
<tr>
<td>Iguana</td>
<td>- 5</td>
<td>- 11</td>
<td>- 9</td>
<td>- 2</td>
</tr>
<tr>
<td>Cameleon</td>
<td>- 2</td>
<td>- 17</td>
<td>- 3</td>
<td>- 1</td>
</tr>
<tr>
<td>Salmonader</td>
<td>- 1</td>
<td>- 12</td>
<td>- 1</td>
<td>- 2</td>
</tr>
<tr>
<td>Frog</td>
<td>- 10</td>
<td>in all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipa or Surinam toad</td>
<td>8 in all</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### II. Serpents.

<table>
<thead>
<tr>
<th>Species</th>
<th>Vertebra to which Ribs are joined</th>
<th>Vertebra of the Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viper (berus)</td>
<td>-</td>
<td>139</td>
</tr>
<tr>
<td>Spectacle snake (naia)</td>
<td>-</td>
<td>192</td>
</tr>
<tr>
<td>Garter snake (matrix)</td>
<td>-</td>
<td>204</td>
</tr>
<tr>
<td>Amphibianana</td>
<td>-</td>
<td>54</td>
</tr>
<tr>
<td>Bow (constrictor)</td>
<td>-</td>
<td>252</td>
</tr>
<tr>
<td>Common snake</td>
<td>-</td>
<td>244</td>
</tr>
<tr>
<td>Rattlesnake</td>
<td>-</td>
<td>175</td>
</tr>
<tr>
<td>Slow worm (anguis fragilis)</td>
<td>-</td>
<td>32</td>
</tr>
</tbody>
</table>

**Of the Ribs and Sternum.**—The thorax of reptiles is very various in its structure. Frogs have a sternum, but no ribs; serpents have ribs, but no sternum; tortoises have the ribs ossified to the back-shell, and the sternum included in the breast-plate; the crocodile and lizard have perfect ribs, but their sternum is almost entirely cartilaginous. In the crocodile, the first portion of the sternum is ossified and elongated. It receives the two clavicles. The remaining part is entirely cartilaginous. It is united with the os pubis, and forms several cubical cartilages to the pareties of the abdomen. This structure, constituting a species of abdominal sternum, apparently for supporting the viscera, is quite peculiar to the crocodile. The ribs are twelve in number, the two first and two last of which are not attached to the sternum. The intermediate ribs have upon their posterior edges cartilages partly ossified, which supply the place of the angles of the ribs in birds. All the posterior ribs, beginning at the fifth, are only articulated to the transverse processes of the vertebrae, which are of great length. The fifth articulate with the vertebra at two points, one on
its body, and the other on the transverse processes. The
iguana and the tupinambis have only the upper part of the
sternum ossified: it is broad, and receives fix ribs and the
clavicles; the other ribs are free. The chameleon poisselles
likewise the upper portion of the sternum; but almost all
the ribs have cartilages, which extend to the middle line,
and are there united to the opposite ones. Frogs, though
they have no ribs, have nevertheless a very conspicuous
sternum. It forms on the anterior part a cartilaginous ap-
pendix, furnished by a disk situated below the larynx. It
next receives the clavicles, and then expanding, it terminates
at last in another disk situated under the abdomen, and
which affords an origin for muscles. There is a peculiar
bony cyst of unknown use on the internal surface of the
sternum, in the rana pipa.

The salamander has ribs, so short that they seem to be the
transverse processes of the vertebrae; they have only one
point of articulation, upon which they have but little
motion. These rudiments of ribs are twelve, in number on
each side. This reptile has, properly speaking, no sternum,
but its place is partly supplied by the bones of the shoulder,
as we shall presently see.

The skeleton of the chelonian reptiles exhibits to us
what appears on the first view as a completely anomalous
organization. In the bony house which these animals
carry about with them, there is such a deviation from the
ordinary figure, connection, and position of the parts, com-
opposing the skeleton of other vertebral animals, that a
haughty view would lead us to infer that the general mo-
del to which Nature in all her modifications of form and
position ever adheres, has been completely loft flight of,
and another substituted in its place. This inference would
be altogether incorrect: a more accurate examination en-
ables us to discover in the external bony shells of these
singular creatures, all the offensive pieces, which belong
to the chel of a mammiferous animal or bird; so that no essentil part is wanting in their thorax, and the
singularity depends merely on the more or less complete
ossification of the whole pectoral cage, and the peculiar
forms resulting from this circumstance. Thus, instead of
the anomaly, which a haughty glance leads us to anticipate,
we actually discover, on the contrary, a new proof of the
confinacy, with which an original model is retained
throughout whole clades of animals, even under the widest
differences of external form, as if Nature, having fixed on
one general principle of organization, would not be at the
trouble of inventing others, but rather chose, by the strange
modifications, to accommodate the organs to new situ-
tions and forms. It is a new illustration of that principle,
in conformity to which the fin of a whale contains all the
bones of an upper liab of a quadruped, the wing of the
bat the regular digital phalanges, the fin of a penguin or
seal the usual bones of the extremities of a bird or mam-

Reptiles.

The bones of the chel in the tortoises form a more or
less convex shield-like covering, which constitutes the upper
surface of the animal; we call it the upper shell (carapace,
bouclier, &c.); and a nearly flat portion adapted to its
concavity below, constituting the inferior surface of the
animal: this is the under shell (plastron).

The back shell is formed by the expansion of eight ribs
or offensive plates, which arise from the joints of the vertebrae,
and terminate in a border that surrounds the whole shell; 
these bones are united together by real futures, situated
transversely. Above, and all along the middle part of the
shell, we observe a row of little offensive plates, almost square,
itimately connected together, and to the plates formed by
the ribs, by synarthrosis, and equal in number to the ver-

The plates represent the rings and longitudinal pro-
cesses of the vertebrae. The offensive margin is made up of
a great number of pieces, (eleven on each side, and a single
one in the middle, before and behind, therefore 24 in the
whole,) united together with, which their union form an
edge or border with three surfaces, viz. the superior, which
belongs to the back shell; the inferior, which is joined to
the breast-plate by a thick leather-like skin; and the
internal, which presents a groove for the reception of the
extremities of the ribs. These pieces, which Geoffroy
compares to the flanell or cartilaginous portion of our ribs,
are wanting in the soft tortoises, (trionyx, Geoffr.); or at least
remain constantly cartilaginous or membranous, so that the
middle only of the upper shell is sustained by an offensive disk.

The turtles, and the soft tortoises, are the only genera
in which the ribs, confounded in the upper shell or carapace,
are nevertheless distinct, both by a prominence very ap-
parent on the inside of the shell, and by a free unattatched
portion of their ends projecting beyond the edge of the
shell. But the offensive disk, composed of articulated pieces,
and already mentioned, extends round the ribs in the tur-

tiles, receiving their ends, but is wanting in the soft tortoises.
Its solidity is increased in the former by the great plates
which cover it, while it remains flexible in the latter, and
is covered only by a species of epidermis.

The ossification of the intervals of the ribs, forming the
carapace, is perfected gradually, and is not finished until
long after that of the ribs themselves: it generally ad-

vances from the middle towards the edges. Thus, in a
young turtle the ribs will be found separate from each other,
towards their external extremities, for half their length;
while in an adult individual of the same species, the anterior
ribs are united throughout, while the intermediate ones are
separated only through about one-sixth of their length.

The carapace is always oval and pointed behind in the
turtles; elliptical and gibbus in the land tortoises; ellip-
tical and flatter in the fresh-water tortoises. Its surface
is rough in the soft tortoises; elevated into various pro-
minences in the chelides and the serpentine, and more or
less smooth in the others.

The margin of the upper shell assumes a different ap-
pearance at its anterior part; it is there a square piece of bone,
convex above, and concave below, which sustains a spine
for the attachment of muscles. Its anterior edge has more
the form of a crescent ( lunula ); there are also some little
peculiar pieces above the tail.

The breast-plate of the tortoise is its sternum; and when
deprived of the thick skin that covers it, exhibits, in some
species, only one solid plate, formed of several pieces,
united by synarthrosis: in others, this plate is perforated
quite through, and composed of several bones, some of which
are fixed in the middle line between the anterior and pos-
terior part, while others are placed laterally, and fastened
together by the help of the former, which support them.
For further information concerning the offensive fabric of the
chel in these reptiles, two memoirs in the 14th vol. of the
Annales du Museum may be consulted; " Sur les Tortues
mollles, par Geoffroy St. Hilaire; " " Sur les offennes Foss-
iles de Tortues, par Cuvier."

In the drcan volans the ribs form the skeleton of the
wings, or those expansions of the integuments between the
front and back limbs, which are so called. The five pos-
terior ribs are elongated and bent backwards for that pur-
pose. Here progressive motion is performed by these
ribs; but they are superadded for this purpose, and make
no part of the organs of respiration. The animal cannot

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in truth be said to fly: its lateral membranes act like a parachute, and enable it to take long leaps.

The ribs are usually articulated to the vertebrae by means of a convex surface, which moves upon a slightly concave one formed in two of the vertebrae; so that the hollow receiving each rib is situated between two vertebrae of the back. But in the snape tribe the head of the rib has two slightly concave surfaces, which move upon a convex protuberance belonging to each vertebra; so that the rib rests on a single vertebra. The consequence of this peculiarity is, that the ribs do not interfere with the motions of the individual vertebrae, and thus that the latter are left free to execute those movements on each other, which take place so extensively in the progression of serpents. The articulations of the vertebrae to each other, and to the ribs, are represented of the natural size from the skeleton of a large boa, in the Philos. Trans. 1812, pt. 1, pl. 6.

We have already seen the ribs, instead of contributing to the busiefs of respiration, employed for purposes of locomotion in the draco volans. They are still more extensively employed for the same purpose in the serpent tribe, in which they amount sometimes to 350 pairs, as observed by Sir Everard Hume. These bones, in all snakes, are continued to the anus, while the lungs seldom occupy more than one-half the cavity covered by the ribs. The hind ribs can only be employed for the purpose of progressive motion, and thus correspond to the elongated ribs of the lateral membranes in the draco volans.

The ribs of a snake may be seen to move forwards successively when the animal is in motion, like the feet of a caterpillar, and the ends of these bones can be distinctly felt on the palm of the hand, as the animal pales over it.

At the termination of each rib is a small cartilage in shape corresponding to the rib, only tapering to the point. Those of the opposite ribs have no connection, and when the ribs are drawn outwards by the muscules, are separated to some distance, and rest through their whole length on the inner surface of the abdominal scuta, to which they are connected by a set of short muscules: they have also a connection with those of the neighbouring ribs by a set of short straight muscules.

When the snape is going to put itself in motion, the ribs of the opposite sides are drawn apart from each other, and the small cartilages at the ends of them are bent upon the upper surfaces of the abdominal scuta, upon which the ends of the ribs rest; and as the ribs move in pairs, the scutum under each pair is carried along with it. This scutum, by its posterior edge, lays hold of the ground, and becomes a fixed point, from whence to set out anew. This motion is beautifully seen, when a snape is climbing over an angle, to get upon a flat surface.

The coluber and boa, having larger abdominal scuta, which may be considered as hoofs or shoes, are the best fitted for this kind of progressive motion; there is, however, a similar structure of ribs and muscules in the anguis and amphibians. In the anguis the ribs are proportionally weaker, and as these have nothing to correspond to the scuta, this mode of progressive motion is probably less necessary to them. See "Observations intended to shew that the Progressive Motion of Snakes is partly performed by means of the Ribs," by Sir Everard Hume. Philos. Transact. 1812, pt. 1, pl. 182, with figures. We are also indebted to Sir Everard Hume, in conjunction with Dr. Ruffel, for describing more particularly a fact noticed by Blumenbach, (Comp. Anat. p. 117.), viz. an adaptation of certain ribs in the cobra de capello (coluber naia, L.) to the accomplishment of a particular mechanism in that animal.

This serpent is called the hooded snake, from a power of expanding the skin of the neck, which is effected by the motions of the ribs. In other serpents, the ribs, from the first vertebra to those of the middle of the trunk, gradually increase in length; thence they gradually shorten or decline, to near the end of the tail, where they disappear, or are transformed into short eminences. In the naia, the cervical ribs gradually lengthen to the tenth or eleventh, after which they successively shorten to the twentieth. Again increasing in length, they are, at the middle of the trunk, nearly as long as the middle cervical ribs, and then declining as in other serpents, disappear on the tail.

The first twenty ribs, instead of bending equally with the others towards the belly, go out in a lateral direction, having only a slight curvature, and when depressed lie at the side of the spine upon one another. The first is shortest; they lengthen to the tenth, and are again shortened to the twentieth; so that, when they are extended, they represent an oval figure, of which the spine is the middle line or long axis. In the extended state of the ribs, the skin of the neck is brought over them, forming the hood; and in their depressed state it recedes. From the rounded form of the hood, the skin has the appearance of being inflated; but the most careful examination did not discover any communication between the trachea or the lungs and the cellular membrane under the skin. See "Remarks on the voluntary Expansion of the Skin of the Neck in the Cobra de Capello," &c. by Pat. Ruffel, M.D. and Everard Hume, eqv. Philos. Trans. 1802, pt. 2, pag. 346.

The existence of ribs has been denied in the furen lacerta, and protozo anguinus: they have in truth merely very insignificant rudiments of ribs, that might be easily overlooked. These have nothing to do with the respiration of the animals, indeed they are too small to answer any purpose. See the description of these animals at the end of the present article.

Such rudiments of ribs are said to exist in the genus cavia, among serpents.

 Bones of the Shoulder.—In oviparous quadrupeds the gelenoid cavity of the shoulder is partly composed of the scapula, and partly of the clavicle. The scapula, which is elongated, has no spine; it contracts and becomes thicker towards the neck. The clavicle is simple, short, and flat, and united to the sternum in the crocodile and lizards. It is broad, and almost square, in the iguana and camelion; in the tupinambis it is oval, and very large and long between the front and back, and has two un-officed parts. The frog and toad have two clavicles to each shoulder, attached to the two extremities of the sternum. The scapula is bent, and composed of two articulated pieces, with the superior one inclined towards the spine. The same conformation obtains in the Surinam toad. The anterior clavicles appear to correspond to the os furciforme of birds. The clavicle, the sternum, and the first piece of the scapula, are anchylosed together. The fasciodes have the shoulder formed in a most singular manner, the scapula, clavicle, and sternum, conflit only of a single bone, which receives the head of the humerus. The shoulder is almost all cartilaginous, but the part answering to the clavicle is more distinct than the rest. It inclines towards the spine, where it receives the muscles by which it is moved. The clavicular part is directed towards the head; that which supplies the place of the sternum turns towards the breast, but without uniting with the bone of the opposite side; the part on the right side slides over that on the left. This conformation allows a greater dilatation of the breast in respiration. The tortoise has
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has also these three bones, which unite to form the glenoid cavity, and correspond with the scapula, fork, and clavicle. But as their respective disposition is very remarkable, it appears necessary to give a particular description of them. One of the bones extends from the base of the rudiment of the first rib, to which it is fixed by a ligament, as high as the humeral cavity, where it is intimately connected with the other two. The second bone may be considered as the continuation of the first, which it joins at the humeral cavity, of which it forms part. Its other extremity is attached to the breast-plate, and strong ligaments likewise unite the extremity to that of the posterior bone. These two bones, thus united, are slightly bent outwards, so as to leave between them and those of the opposite side, an oval space, through which the oesophagus, the trachea, and several muscles, pass. The first seems to correspond to the clavicle, and the second to the os furciforme. Finally, the third bone of the shoulder is situated below the abdominal and thoracic vices, nearer the breast-plate. It is long, and extends from the humeral cavity, of which it forms the lower part, as far as the abdomen. It seems to supply the place of the scapula by the number of muscles inserted into it, but its situation is just the reverse of that bone. A very strong ligament unites this bone to the second.

Bone of the Arm.—The humerus of the tortoise has a very remarkable shape. As in birds it is articulated at once to the scapula, clavicle, and os furciforme, by a large oval head, the greatest diameter of which lies in the direction of the flattened bone. A considerable eminence rises above this large head, which, by its curvature and its ufe, has some relation to the olecranon, a process which, in this animal, the bone of the fore-arm wants. Below the head there is another eminence, less projecting; but more rough, which likewise serves as a point of insertion to some muscles, and supplies the place of the little tuberosity. The rear of the body of the bone is flattened and narrow towards the middle. In the crocodile, the humerus is round, but a little bent like an S in its whole length. At the extremity that joins the scapula, it resembles the tibia; its head, instead of being round, is flat; and its tuberosity, which is fingle, is anteriorly in the form of a ridge, and somewhat inclined inwards. In the other lizards, and in frogs, the humerus exhibits nothing peculiar. Serpents having no limbs, have consequently no humerus.

Bones of the Fore-arm.—The humerus of the crocodile terminates in two round tubercles. The hollow head of the radius turns upon the external one. Between them the round head of the ulna is situated, but it has neither olecranon nor sigmoid cavity. In the upper part it is the largest of the two bones, but the smallest below. There is nearly the same conformity in the camel, but the bones are more elongated, and the inferior head of the radius is less than that of the ulna. In the frog the fingle bone of the fore-arm is articulated by a concave head, with a large round tuberosity on the bane of the humerus, between its two condyles. On each side, where the lower part of this bone becomes larger, we observe a furrow, which is the only vestige of a distillation into two bones. Troja has pointed out a singularity in the structure of the bone of the fore-arm and of the leg in frogs and toads. These bones consist of a fingle piece, which is solid in the middle, but divided at either extremity into two conical portions, having a manifest medullary cavities. See Memoria sopra la ftruttura singolare della tibia e del cubito nelle Rane e nei Rohipi, in his Sperienze intorno alla Rigenerazione delle Offa. Nap. 1779, p. 250, t. 7, 8.

The two bones of the fore-arm of salamanders are situated one above the other. The ulna, which is the lower, and somewhat longer of the two, has no olecranon; but there is a sort of rotula in the tendon of the extensor muscles. The ulnar extremity of the humerus is much enlarged. The articular surface which terminates it is convex, and permits the radius and ulna to turn together in every direction. The two bones of the fore-arm in the turtle are always in a forced state of pronation. The radius, which is much longer than the ulna, and fixed to it by a cartilaginous substance, is the lowest, and extends even under the carpus. These two bones much resemble each other in the humeral extremity, being formed by a single concave surface received upon a correspondent pulley of the humerus. Their articulation is such that it allows them to move together laterally, and a little upward and downward in the action of swimming.

Bone of the Hand.—The frog, the toad, the salamander, have three ranges in the carpus. The first consists of two bones, one radial and one ulnar; the second consists of three bones, the largest of which bears the rudiment of a thumb with two joints; the third range has likewise three bones. The second fingers proceed from the first of these bones; the fourth finger is articulated with the second bone; the middle finger articulates with both bones; the little finger joins the third bone. The first range touches the third inferiorly, because the second is cuneiform. There is no bone without the range. In the mud tortoise, the first range is a single bone, which separates the radius from the ulna; the second range consists of two bones, and a small one out of the row, situated on the ulnar edge; the third range consists of five bones, one for each bone of the metacarpus. The sea tortoise has three bones in the first range, the ulnar bone being the longest. The two anterior bones do not advance much farther. The third range consists only of three bones for those of the metacarpus, and one small bone out of the row, situated upon the radial side.

In the crocodile, the first range consists of two long parallel bones. It has besides two little external bones without the range on the radial side. The number of the phalanges varies in these animals. The crocodile has the hand rounded. It has two phalanges to the thumb, three to the second finger, four to the middle and fourth fingers, and only three to the little fingers.

The camel has three fingers on one side, and two on the other, which form, with the three opposite to them, a kind of forceps. The number of the phalanges is the same in the crocodile, with the exception of the little finger, which has four. In the salamander the little finger is obliterated, and the thumb has only two phalanges.

The frog has only one phalanx to the thumb. The two following fingers have only two phalanges. The other two fingers have three.

The hand of the sea tortoise is long, and comprefsed in the form of a fin; there are two phalanges to the thumb, three to the three succeeding toes, and two only to the left. A similar conformity is observable in the mud tortoise; with this exception, that its hand is rounded.

Bone of the Pelvis.—In the turtle, that part of the os innominatum which corresponds to the pubis, is the most considerable. It proceeds from the cotyloid cavity by a thick portion, which comes forwards and widens into a thin flat lamina, divided into two parts; one is turned towards the middle line, by which the two corresponding bones are united; the other is free, and is directed to the external side. The portion which corresponds with the ilium is short, narrow, and thick; it rests on the shell, and is joined to the sacrum; finally, the portion which is analogous to the
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The fuchian presents us with arrangements in their extremities, not met with in any of the mammalia. We have species possessing only fore-limbs, or only hind-limbs; others with four limbs, and one toe only on each; and other unusual combinations in the number of toes on the fore and hind-limbs. These circumstances are noticed in those lizards which approach to the form of serpents, and whose small imperfect limbs seem more like rudiments than complete members, serving as intermediate links between the fuchian and ophidian orders. See Lacépède in the Ann. du Muscum, ii. p. 351; with figures of a lizard modestly, and tetrapod; and Daudin in his Hist. Nat. des Reptiles, vol. iv. in the history of the genera Serps and Chalcide. We know nothing, however, about the osteology of these—we might almost lay—ridiculous limbs, they are so obviously inadequate to the purpose of locomotion.

MUSCLES OF THE SPINE.—There are few spinal muscles in frogs. The muscle which is analogous to the fuchian-coccogeus is large and thin, and occupies all the space comprised between the long bone of the coccyx and the ilia. Its fibres are oblique, and it serves to draw the coccyx into the direction of the spine. That which is analogous to the lumbo-coecalis, arises above the last by a sort of point attached to the coccyx. It extends quite to the head, into which it is inserted, and detaches fibres in its progress to each of the transverse processes, which form a kind of interfeccion upon its surface. The obliquus superior arises from the head at the margin of the foramen magnum, and is inserted into the transverse processes of the first dorsal vertebra. There is only one small rectus anterior, it arises from the base of the cranium, below the foramen magnum, and is inserted into the transverse processes of the first dorsal vertebra. The inter-transverse processes are like the humerus. The spinal muscles of the salamander much resemble those of the frog; those of the tail are very similar to the muscles of fishes. The spine of the tortoise has no motion except in the parts belonging to the neck and tail. Those of the back and loins, which are ossified together, have no muscles. The muscles of the neck are very different from those of man. The motions they produce are those of elongation, by which the head is protruded from the shell; and those of retraction, by which it is withdrawn, the neck being bent in the form of a Z. The first of the muscles proper to the neck is attached to the under part of the anterior lateral border of the back-shell, and into the transverse process of the first vertebra; it raises the neck and draws it back. Another proceeds from the anterior and middle part of the shell; it is inserted by four flabby lips, which are separate throughout a considerable portion of their extent, into the articular processes of the second, third, fourth, fifth, and sixth vertebrae of the neck. It draws the neck back when the head is much extended, and pulls it out when it is retracted. A muscle also arises from the articular processes of the third, fourth, and fifth vertebrae of the neck, by three flabby portions that afterwards unite, and terminate in two tendons; one of which is inserted into the transverse process of the first, and the other into the muscular process of the second vertebra. This muscle bends the neck upon itself, making it describe a curve, which is convex downwards; this motion brings the head under the shell. A muscle analogous to the longus colli arises from the under part of the body of the second dorsal vertebra, beneath the shell; it ascends along the neck, and furnishes aponeurotic slips to all the transverse processes,

Thigh-Bone.—The femur of oviparous quadrupeds resembles that of other animals; it has, however, a double curvature, more or less evident. In front it presents a convexity towards the tibial extremity, and a concavity near the pelvis. In the tortoise the trotanchers are well defined, but they are not to be found in the lizards and frogs. The figure of the femur is in general round, except in the Surinam toad, in which it is very flat.

Bones of the Leg.—Oviparous quadrupeds have the tibia and fibula distinct and separated from each other throughout their whole length. These two bones are nearly of the same magnitude in the tortoises and lizards. The frog has but one bone, but a furrow seems to indicate the union of the tibia and fibula. In these animals the tibia and fibula are, for the most part, directly articulated to the thigh-bone.

Bones of the Ankle.—The astragalus is articulated to the tibia, and the os calcis to the fibula in all reptiles. The tarsi of the crocodile have five bones, viz. an astragalus, an os calcis, two cuneiforms, answering to the two middle metatarsal bones, and one out of the range, which answers to the external metatarsal bone. There are four metatarsal bones. The bone situated without the range serves to support the little toe in the mud-tortoise. In the sea tortoise it is very flat. The os calcis and astragalus are very small. In frogs, the astragalus and os calcis are very long, and might at first sight be taken for the tibia and fibula, if they did not form the third joint of the posterior extremity. There are on the fore part, four little cuneiform, five metatarsal bones, and one in the form of a hook, which is very minute. These are similar in the Surinam and common toad.

Bones of the Toes.—The number of the toes varies much in reptiles; as may be seen from the following table.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Toes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crocodile</td>
<td>2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Lizard</td>
<td>2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Cameleon</td>
<td>2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Salamander</td>
<td>2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Sea totoise</td>
<td>2, 3, 3, 4, 2, 2, 2</td>
</tr>
<tr>
<td>Mud totoise</td>
<td>2, 3, 3, 3, 2, 2</td>
</tr>
<tr>
<td>Frog</td>
<td>1, 2, 2, 3, 4, 3</td>
</tr>
</tbody>
</table>

The fuchian presents us with arrangements in their extremities, not met with in any of the mammalia. We have species possessing only fore-limbs, or only hind-limbs; others with four limbs, and one toe only on each; and other unusual combinations in the number of toes on the fore and hind-limbs. These circumstances are noticed in those lizards which approach to the form of serpents, and whose small imperfect limbs seem more like rudiments than complete members, serving as intermediate links between the fuchian and ophidian orders. See Lacépède in the Ann. du Muscum, ii. p. 351; with figures of a lizard modestly, and tetrapod; and Daudin in his Hist. Nat. des Reptiles, vol. iv. in the history of the genera Serps and Chalcide. We know nothing, however, about the osteology of these—we might almost lay—ridiculous limbs, they are so obviously inadequate to the purpose of locomotion.
as far as the second vertebra, where it is inserted. This also is one of the retractor's of the head. There are very distinct inter-articulars, which by their action elevate each of the vertebrae, and consequently extend the neck. The transverso-spinalis is situated on the posterior part of the neck; it arises from all the superior transverse processes, and is inserted into all the spinous processes as far as the sixth. Finally, a short muscle proceeds from the upper part of the first dorsal vertebra below the shell, and is inserted into the articular processes of the sixth and seventh cervical vertebrae. This muscle is peculiar to the tortoise, and begins the extension of the neck when the head is concealed within the shell.

Muscles of the Ribs, Abdomen, &c.—In the frog, which wants ribs, and the tortoise, where they are immovable, the muscles which usually have their insertions in them, are in those animals extended to other parts. Thus in the tortoise, whose breast-plate occupies the place of the abdominal muscles, they are inserted into the pelvis, which they move. With respect to those animals, one very remarkable observation may, in general, be made. It appears that the very singular shape of the muscles and bones depend upon each other. Indeed, as the muscles are not placed upon the bones, they have not, if we may be allowed the expression, fashioned them; and the want of motion in the bones, which has given an unnatural figure to the trunk, has also given to the muscles other forms and other uses. The abdominal muscles of the frog present nothing peculiar, except that the skin does not adhere to their surfaces, and that instead of being inserted into the ribs, they are fastened to the sternum by a strong aponeurosis. The same observations may be made with respect to the foweters.

We have described, in the osteology, the adaptation of the ribs of reptiles to the purpose of progressive motion; and now proceed to point out the muscles by which they are moved forwards or backwards, and connected to the abdominal feusta. The ribs are brought forwards by five sets of muscles placed on the outside of the chest, and passing obliquely from above, downwards, outwards, and backwards. 1. One from the transverse processes of each vertebra to the rib behind it. 2. The next set arises from the ribs, at a short distance from the spine, parallels over two ribs, passing obliquely from above, downwards, outwards, and backwards. The third arises from the posterior edge of each rib, parallels over two ribs, and is inserted into the third rib behind it. The fourth set parallels over one rib and is inserted in the second. The fifth goes from rib to rib.

The muscles carrying the ribs backwards are found on the inside of the chest, and flint from the spine forwards and outwards. A strong set arises from the anterior surface of the vertebra, goes over four ribs, to be inserted into the fifth about its middle. The serrated portions of a strong flat muscle, forming the muscular covering of the abdomen, arise from this part (the middle of the internal surface) of each rib. The right and left muscles unite in a beautiful middle tendon. Thus it is obvious, that the inferior half of each rib (below the origin of the serrated portion just described) is external to the abdominal muscles, and consequently free for the purpose of progressive motion.

The ends of the ribs are connected to the abdominal feusta by a set of short muscles; they are also connected together by short and straight muscles. Another set goes from the heads of the ribs obliquely backwards to be fixed in the skin at the edge of each scutum. See Sir E. Hume's paper quoted in the osteology; and particularly plates 4 and 5 from Mr. Clift's drawings, in which the parts are represented.

There is a complicated muscular apparatus for extending and retracting the ribs, and carrying the skin forwards and backwards in the cobra de capello. The ribs are raised or carried forwards by four sets of muscles, all arising from and inserted in these bones, and directed obliquely from above, downwards and outwards.

The skin of the back is brought forwards on the neck by a large set of very long muscles, arising successively from each of the first twenty ribs, by a tendon, which soon becomes fleshy. The length is about two inches. They go backwards to be inserted into the skin, which they can bring forwards to a great extent when the ribs have been first extended.

The muscles which carry the ribs back again lie on the inside of the chest under the spine. One set goes from the vertebrae of the neck to the lower edges of the ribs; but they pass obliquely upwards and outwards over three ribs, to be inserted into the fourth, thus acquiring a length of fibre, by which the range of motion produced is much increased. The second set goes from the ends of the ribs forwards to the skin, which they will draw back. The third set from the root of one scutum to the scutum immediately above it, so as to bring it down upon the other.

Sir E. Hume's and Dr. Ruffell's paper, and particularly the engravings from Mr. Clift's drawings. Phil. Trans. 1804, pt. 2.

Muscles of the Head.—The muscles of the head of the tortoise cannot be described under names similar to those of mammiferous animals and birds, because the skull affords insertion to the greater number of them. We will, therefore, only distinguish them by the points of attachment. Thus, in viewing the back part of the neck, we remark, 1st, at the anterior part of the back-skin, near the angle of the lunula, a broad muscle, which extends to the lateral and posterior parts of the head, into which it is inserted. It pulls the head backward. 2d. Beneath, and from the middle of the anterior lunula of the back-skin, there arises another muscle, which is thin and round, and which, in separating from that of the opposite side, forms an angle like the letter V: it is inserted on the outside of the preceding muscle, and has the same use. 3. A muscle analogous to the splenius capitis arises from the spinous processes of the fourth and fifth cervical vertebrae, by distinct slips, and is inserted into the occipital arch. Its use is to raise the head. 4. A muscle analogous to the rectus major anncus rises from the inferior tubercles of the fourth vertebrae next to the atlas, and is inserted, fleshy and thick, into the depression of the cuneiform process below the condyle. 5. The tracheo-mastoideus rises from the inferior tubercles of the second and third cervical vertebrae, by two thin aponeurotic tendons; it is inserted, by a very thick and entirely fleshy portion, into the protuberance that answers to the mastoid process. Its use is to bend the head laterally. 6. Lastly, at the superior part of the cervical spine there is a short muscle, which proceeds from the inferior part of the foramen, formed by the temporal fossa, and is inserted into the spinous processes of the first, second, and third vertebrae of the neck. On viewing the neck in front, we observe the muscle analogous to the interno-clido-mastoideus attached to the strong aponeuroses that surround the humerus at its articulation with the scapula. The lower part of it, for one-third of its length, can only be seen, the remainder being concealed by a muscle composed of transverse fibres, which supplies the place of the mylo-hyoideus, and platysma-myoideus. It is inserted into a process corresponding to the mastoid. Its use is to draw
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draw the head inwardly, and to produce a small elevation of the shoulders. The longus capitis arises from the third vertebra of the back, and is inserted by a slender tendon into the cuneiform processes of the occiput. The frogs have very few of the muscles of the head; most of those which are inserted in it are employed in moving the superior extremities, or are proper to the vertebral column. The muscle analogous to the obliquus superior arises from the first transverse processes of the spine, and is inserted into the superior part of the occiput: its direction is oblique from without inwards. That which is analogous to the rectus capitis anticus minor, arises from the transverse process of the first vertebra, and is inserted into the axis of the cranial below the foramen magnum. These are the only two muscles proper to the head in frogs: they are similar in the land salamander.

MUSCLES OF THE SHOULDERS.—In the frog (which has no ribs) the serratus major has an extraordinary shape, which appears to be occasioned in part by the want of the cervical vertebrae: it forms three distinct muscles. The first arises from the occiput, near to the foramen magnum. It divides into two bellies, which are inserted into the superior spinal angle of the scapula; one on the internal, and the other on the external face. The second proceeds from the second transverse process, and passes under the dorso-lateral portion of the scapula, towards its spinal angle. The third proceeds from the third transverse process, and passes underneath the preceding, keeping still nearer to the edge. There is besides another muscle proper to the scapula, situated upon its internal surface, between the two constituent parts, which make it appear broken. It appears to draw these two parts closer together, and by its contraction renders the angle they form with each other more acute. There is no muscle analogous to the pectoralis minor. The place of the levator, or angularis scapula, is supplied by a very considerable muscle which arises from the base of the occiput; it becomes perceptibly smaller as it approaches the shoulders, and is inserted into the posterior edge of the cartilaginous part of the scapula. The omo-hyoideus is long and thin; it comes from the great inferior horn of the os hyoideum, and is inserted under the neck of the scapula. The trapezius is wanting. The muscle analogous to the rhomboideus is very thin. It arises from the dorsal processes, and is inserted into the spinal edge of the scapula. There is no sublabialis muscle. The ilerno-mastoideus has only one belly, which extends obliquely from the posterior part of the head, behind the ear, to the neck of the osseous part of the scapula. Its action is evidently that of pulling the shoulder towards the head, and raising it up. We shall describe the muscles of the tortoise separately, as they differ considerably from those of other red-blooded animals. They are only three in number. One of them, though very unlike the trapezius, is similar in its use: it rises from the lower surface of the back-sheil among the ribs, from the second to the fifth. It is very thin, and passes to the external margin of the third bone of the shoulder, which seems to correspond with the scapula. A muscle analogous to the levator scapulae, is inserted into the curve formed by the joint of the two first bones of the shoulder. It arises by seven flabby heads from the transverse processes of the seventh vertebra of the neck. Another long muscle arises from the inner surface of the back-sheil near the teres internus of the first rib, and is inserted into the dorsal extremity of the third bone of the shoulder. It is perhaps analogous to the costocervicalus.

MUSCLES OF THE Arm.—The pectoralis major of the frog is composed of two portions, placed one above the other. They produce two tendons which are inserted on each side of the humeral groove. The latissimus dorsi arises from the inferior part of the back, where it is thin. It becomes thicker, and is attached to the broad part of the scapula, which it entirely covers. It is inserted, by a strong tendon, into the internal surface of the humerus, above one-third of its length from its superior end. In the frog there is neither the sупra nor the infra-spinatus. The subscapularis or coraco-brachialis, for the muscle of which we now speak supplies the place of both, arises from the internal surface of the scapula, at its junction with the clavicle, and is inserted into the interior part of the humerus about one-third from the head. The deltoid is formed of three portions. The first, which is the longest, and very slender, proceeds from the anterior part of the ilenum. The second arises from the union of the clavicle with the scapula, at the internal surface, runs over the bone above the joint, then sends a thin tendon to the first in its passage, and is partly inserted in the linea alpina, and partly in the inferior portion of the humerus. The third is distinct; it arises partly from both the scapula and clavicle, and is inserted into the scapular extremity of the humerus. The teres major and teres minor are wanting. Besides these muscles, in which we discover an analogy to those of mammiferous animals, there is one which arises from the second transverse branch of the ilenum, and is inserted into the inner edge of the groove of the humerus by a broad tendon. It may be regarded as an affilant to the pectoralis major. This conformation appears to prevail in the land salamander.

If the tortoise has fewer muscles proper to the shoulder than common, it has an extraordinary number inserted into the humerus. That which corresponds to the pectoralis major is composed of five portions. Two are superficial; one arises from the edge of the anterior part of the breal-plate, and proceeds to its insertion in the lefser tubercle of the humerus. The other is much more extensive: it rises from a great part of the internal surface of the breast-plate, and is also inserted by a flat tendon in the lesser tubercle of the humerus: but it is prolonged by a fan-like aponeurosis, which extends over the inferior surface of the bone, and even of the forearm. One of the three deeper portions of the pectoralis major arises from the greater part of the second bone of the shoulder, and is inserted into the humerus, below its scapular articulation; another arises from the expansion of the interosseous ligament, which unites the second bone of the shoulder to the third, and proceeds to join its tendon intimately with that of the preceding portion. Lastly, the third, which is the most deep-seated of all, arises from the superior surface of the third bone of the shoulder, or that which is next the back-sheil. Its tendon is conjointed with those of the preceding. The muscle analogous to the deltoid is also composed of two portions; one arises from a ridge on the anterior part of the breast-plate; the other, which is its accefsory, is placed more deeply, and united to its corresponding muscle. They are inserted by one common tendon into the lesser tubercle of the humerus, which they draw towards the neck in the action of swimming. There is another muscle much deeper seated, which seems like a tendon to the deltoid. It arises from the dorsal extremity, and all the internal edge of that bone of the shoulder which corresponds with the clavicle, and proceeds to be inserted into the humerus below the lesser tubercle. On the internal surface of the humerus, we find a muscle rising from the looffe, extremity of the teres internal of the third bone of the shoulder; it is inserted in the humerus, about one-third from its lower end, by a thin tendon. It bears some relation to the ilerno-radialis of the frog, and performs the same office.
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The levator brachii is a very thick muscle, which arises from the third bone of the shoulder, the exterior edge of which it surrounds, and is inserted into the process of the humerus resembling the olecranon, which it pulls upward and outward. A muscle analogous to the teres major arises from the neck of the third bone of the shoulder, externally, and is inserted into the humerus between the two tuberosities. It pulls the humerus backward. Another muscle, which seems a substitute for the latissimus dorsi, arises from the interior part of the back-shell, to which it is attached obliquely, to the interval between the two first ribs. It is inserted into the body of the humerus behind the greater tubercle, by a flat tendon. It pulls the humerus towards the upper shell, when the animal stands upon all its four feet. A muscle, the use of which seems the same as that of the levator brachii, rises from the whole internal surface of that bone of the shoulder which answers to the chivile, and is inserted into the whole length of the olecranon process, or great tuberosity of the humerus. It is very feebly, and appears to be formed of two portions. Finally, the muscle analogous to the capulo-radius, or biceps flexor cubiti, arises from the anterior border of the humeral cavity, and is inserted into the external and superior surfaces of the humerus by a small tendon, which reaches as far as the base of the radius. It extends the member, and brings it toward the head.

Muscles of the Fore-arm.—The frog has, properly speaking, no biceps; its place is supplied by another, and much stronger muscle, situated on the breast, under the pectoralis major, with which it has the same insertions. At the articulation of the humerus it sends out a strong tendon, which passes along the groove of the humerus, and through a tendinous ring, formed by the two parts of the pectoralis major, under the deltoideus. It is inserted into the humeral extremity of the radius, and may be named terma-radius. There is no brachialis internus. The triceps is composed of three parts, nearly as in man, but they are proportionally larger. There is but one supinator, which arises from the external condyle, and is inserted into the carpus. There is also but one pronator, which rises from the internal condyle, and is inserted into the carpus. In the turtle, these muscles are almost entirely aponeurotic, and, produce but very little motion, the place of the member being supplied by a fin, as in the cetacean. In general, the muscles of the humerus produce the motions of the fore-arm.

Muscles of the Hand and Fingers.—In the sea tortoises, which have the carpus compressed and fitted for swimming, the muscles are only simple bands of aponeurotic fibres, which strengthen the several articulations. The muscles of the hand of the frog and salamander are very familiar to those of man. Those of the thumb are wanting, except the extensor, which comes from the external condyle, and is inserted into the lail phalanges. The other muscles vary very little.

Muscles of the Pelvis.—In the tortoises, the muscle analogous to the quadratus lumboorum expands under the back-shell, between the last anterior ribs; it arises from the ilium, towards the articulation of that bone with the os sacrum, which in this animal is movable. This mobility of the pelvis is assisted by a muscle analogous to the rectus abdominis, which, as we have observed, instead of extending under the belly, is attached under the posterior extremity of the breast-plate by two feebly portions, the one anterior, the other posterior, which are both inserted in the anterior margin of the external branch of the pubis. There is no plosus parvus in frogs. The quadratus lumboorum extends from the long transverse process of the third vertebra, to the origin of the long bone of the pelvis, which is analogous to the ilium. It is inserted in this bone, which it raises towards the head; its ilium being moveable, like that of the tortoise.

Muscles of the Thigh.—In the frog there is only one gluteus, which is in the place of the medius. It arises from the elongation which supplies the place of the os ilium, and is inserted below the head of the femur. The pyroform comes straight from the point of the coccyx, and is inserted about one-third from the top of the os femoris. The gemini and the obturator internus are wanting. The quadratus femoris is long. It arises from the posterior symphysis of the ischium, and is inserted into the inner side of the thigh-bone, about one-third from the head. They have neither the plosus magnus nor parvus. The iliacus is proportionally elongated. The pectineus descends to the middle of the thigh-bone. The three adductors have the same origins and insertions as in man. The obturator externus is to be found, though there is no foramen ovalis. It arises from the symphysis pubis, and its fibres are attached to the capsular ligament. In the tortoise, the muscles of the thigh produce motions proper to swimming; that is to say, the abduction, the adduction, depression, and elevation of the thigh. The muscle analogous to the adductor longus arises from the symphysis pubis, and is inserted into the internal part of the thigh-bone, about one-third from its tibial extremity. Another muscle, which cannot be easily compared to any in man, arises from the interior of the acetabulum, and is inserted into the little trochanter. It is another adductor femoris. A muscle, composed of different radiated fasciculi, arises from the broad inferior surface of the os pubis, and forms a thick tendon inserted into the little trochanter. It occupies the place, and answers the purpose, of the plosus and iliacus. That which is analogous to the adductor brevis arises from the symphysis of the bones of the ischium, and the interosseous ligament of the pubis. It is inserted into the os femoris, below the little trochanter. The muscle answering to the gluteus maximus arises from the spin, opposite to the last rib, and is inserted into the thigh-bone, below the great trochanter. The muscle analogous to the gluteus medius and minimus can barely be distinguished from each other. They rise from the internal surface of the os pubis, and are inserted into the great trochanter. That which resembles the obturator internus arises from the internal surface of the ilium, and the superior edge of the cotyloid cavity, and is inserted into the great trochanter.

Muscles of the Leg.—The frog has the thighs round, like thefe of a man, and the muscles of the leg are very compi- cious. The triceps femoris is formed only of two very distinct portions. The vastus externus and crus are manifoldly but one. There is no rectus anterior. The biceps in other is only one belly. It arises from the posterior and internal part of the ilium, and is inserted into the exterior and anterior surface of the tibia, for there is no fibula. The semi-membranosus is like the human; but the semi-ten-dinosus is composed of two bellies, one of which rises from the symphysis pubis, and the other from that of the ischium. The sartorius is situated in the front of the thigh, without any obliquity. There is nothing remarkable in the gracilis. There is no distinct popliteus. Some differences occur in the muscles of the leg of the tortoise. Thse have a relation to the faculty of swimming, for which its extremities are fitted. The muscle which takes the place of the semi-membranosus arises from the interosseous ligament of the pelvis, and proceeds to form a strong aponeurosis at the inferior part of the leg. That which corresponds to the semi-tendinosus arises also from the interosseous ligament;
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...it passes under the ham, and is inserted into the tibia, which it bends. That which is analogous to the tibialis arises from the os pubis, near the interosseous ligament, and passes over the knee, to be inserted into the tibia, which it extends. A muscle composed of two fleshy portions, both of which arise from the lateral parts of the tarsus, is inserted below the head of the tibia, and bends the leg. In its action, it much resembles the biceps, from which, however, it differs with respect to its attachments. Another muscle, resembling the fascia lata, and very thin in its fleshy part, arises from the sides of the coccyx. It passes under the skin of the fin, to its insertion, almost opposite to the heel. It bends the leg upon the thigh, and extends the foot upon the leg. The muscle analogous to the biceps arises from the tarsus and ilium. It goes to the external surface of the leg, where it is inserted into the fibula. The extensor of the leg presents nothing particular. The muscle analogous to the rectus anterior arises from the internal surface of the pubis, and joins the common tendons of the extensors.

MUSCLES OF THE ANKLE.—In the frog, the gastrocnemius has only one belly; it has, however, a small tendon, by which it is inserted into the outward side of the head of the tibia. Its tendon runs under the heel, and there fusing over a fleshy bone, expands itself under the foot, to form the plan tar fascia. There is neither fleshy nor plantaris. The tibialis anticus arises by a strong tendon from the upper part of the os femoris. About the middle of the tibia it divides into two bellies, one internal, the other external. The tendon of the first is inserted into the tibial bone of the tarsus, and that of the second into the bone, a little more outwardly. An affinitive to this muscle arises from the middle and anterior part of the tarsus, and proceeds to the internal side of the base of the long bone of the tarsus. The tibialis posterior resembles the human, but it is only inserted into one bone of the tarsus, viz. that which is long, and situated at the inner side. There is but one muscle, to which the term peroneus can apply. It arises by a slender tendon, from the external condyle of the thigh, and is inserted into the base of the tibia, on the outside, by two tendinous portions, one of which extends to the bone of the tarsus. It extends the leg with respect to the thigh, or, more properly, the thigh with respect to the leg. Besides these muscles, which extend from the leg to the foot, there is another which arises from the metatarsal extremity of the tibia, at its internal edge, passes between the two bellies of the tibialis anticus, and proceeds very obliquely to its insertion, at the deep extremity of the long bone of the tarsus, on its inner side. In the sea toad, the muscles of the feet are supplied by aponeurotic fibres, somewhat fleshy, which serve only to strengthen the articulations, and keep the fins properly extended.

MUSCLES OF THE TOES.—There is no extensor longus digitorum in the frog; neither is there any flexor proprius pollicis. The extensor brevis digitorum is very distinct, it arises from the whole length of the long external bone of the tarsus, and extends obliquely to all the four toes, the last excepted. It is inserted into the little phalanges. There are superior and inferior interosseous muscles, which are very apparent, to the number of ten. Their direction is very oblique. The flexor communis digitorum is situated under the long bone of the tarsus, on the inner side, and is covered by the aponeurosis of the gastrocnemius. When it reaches the little bones of the tarsus it divides into five tendons, which receive, at their inner side, afflant fleshy fibres, apparently proceeding from a muscle situated below the long bone of the tarsus, on the inner side. It may perhaps represent the flexor longus. In the sea toad all these muscles have their places supplied by bundles of aponeurotic fibres.

On the Support of the Body, and its Motions in Progression.—Standing is an attitude common to all animals, but the circumstances attending it differ very considerably. In most of the oviparous quadrupeds, the knees and elbows are directed outwards as they stand, and even during their various progressive motions. The posterior members, articulated more in proportion at the sides of the body, are so bent, that the belly descends to the ground, and moves along it.

Turtles rest on their plastron, and on their four flattened, elongated, and fin-like members. They may be compared to seals in their mode of executing movements. They employ their members, either in swimming, or in walking on the sea-shore, or in digging holes in the sand to receive their eggs.

In tortoises, standing is nearly the same as most in other oviparous quadrupeds; and the direction of their body is horizontal. Batracians, and frogs in particular, generally have their body, when at rest, in an oblique elevation; the arms sustaining the front part, while the back remains on the ground. The formation of the posterior limbs does not render them adapted to raise the body in a vertical direction, but merely to push it forwards.

Walking exhibits different modifications, according to the number and form of the limbs, and the relative size of the fore and hind-feet. Where they are of equal length, the animals move with great velocity; hence the names of certain species, as lacerta agilis and velox. When, however, the limbs are too small and weak for the body, the movements are slower, as in the crocodile, the chameleons, and the toad.

The feet of the chameleon, and its prehensile tail, make it a better climber than most reptiles. The limbs being all of nearly equal length in the fciaks, they cannot leap well, while the iguanas and tupinambes exhibit considerable agility. The frogs are the great jumpers, from the great length and strength of the hind limbs. But they can hardly walk; moving the front legs only with facility, and being obliged almost to drag the hind ones after them.

Serpents can leap or project their bodies by the sudden extension of several articulations: they form several curves with their body, and then suddenly straighten them, either in whole or in part, according to the way in which they may wish to make.

Creeping, properly so called, belongs only to serpents, and consists of a projection of the body backwards or forwards, produced by the alternate motion of one or several of the lower parts against the ground. The following modifications are exhibited in different inflections. 1. Creeping by vertical undulations. 2. By horizontal undulations. 3. By two or three undulations of the posterior third part of the body, while the two anterior thirds are elevated vertically. 4. A sliding kind of crawling, by small undulations formed by the alternate approximation and separation of rows of scales placed transversely under the body.

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5. The same kind of motion, produced by the alternate formation and disappearance of folds in the skin of the sides, without any undulation, merely by the alternate approximation and separation of rings of the body.

The reptile motions, by which reptiles move their bodies forwards in water, are nearly the same as they employ in jumping; but they must be much quicker. To ride in the water, they must strike the water below and behind them, and diminish the breadth of their body, as much as possible, by carrying their swimming organs backwars after each stroke. Thus we see the frog, after striking, extend its long hind legs, so as to offer no resistance to the passage of the body through the liquid. The act of swimming offers the following modifications. 1. External swimming (on the surface of the water, breathing air) by vertical undulations, without swimming organs. The serpents. 2. The same by lateral undulations, aided by the feet. Iguanas, lizards, &c. 3. Swimming under the surface, breathing externally; by four palmed feet, and without tail. Hyla palmata (Rana maxima, Linn.) 4. The same with four legs and no tail. Frogs properly so called. 5. The same with four feet, an elongated body, and depressed tail. Crocodiles, salamanders. 6. The same by means of four fin-like scaly members, and no tail. 7. Swimming under water, breathing by means of branchial gills.

The dragons are the only reptiles capable of flying. Their flight is nearly the same with that of the potato-squirrel, or flying squirrel. Daudin, Hist. Nat. des Rept. t. 1. p. 256.

The Brain.—The brain of reptiles does not fill more than one-half of their very small cranium; hence its relative size, to that of the body is very inconsiderable. Its pro- portion to the body is said to be, in the tortoise $\frac{3}{5}$, in the turtle $\frac{2}{5}$, in the coluber matrix $\frac{4}{5}$, in the frog $\frac{3}{5}$. Blumenbach justly observes, that anatomists have hitherto bellowed but little labour on the brains of the amphibians. The dura mater forms no procece in this order; the interval between it and the pia mater is filled with fluid; the brain is small and simple, and consists of five roundish eminences. Of these, the single one, placed at the front of the medulla spinalis, is clearly the cerebellum, as in all animals which have a nervous system. Whether the other four are to be regarded as the two hemispheres, and the thalami nervorum opticorum, is more doubtful. According to Blumenbach, the cerebellum does not exhibit the arbor vitae.

All the parts of the brain of reptiles are smooth, and without convolutions. The optic thalami are situated behind the hemispheres, but are not covered by them. They contain each, as in birds, a cavity which communicates with the third ventricle. At the extremities of this ventricle, we observe the anterior and posterior commissures, but there is no soft commissure, nor tuberum quadrigemina.

In the tortoise the hemispheres form an oval. Their anterior part is separated from the posterior by a sulcus, and represents a kind of bulb, which serves as a root to the olfactory nerves. The size of this bulb is about equal to one-third of the hemisphere. The brain of the hemisphere is, as usual, excavated by a ventricle, and contains a substance analogous to the corpus striatum, and which pretty much resembles in its form that of birds.

The optic thalami are not larger than the bulbs of the olfactory nerves. Their form is nearly round. They extend downward and forward, under the hemispheres, to produce the optic nerve. The valve of the cerebrum is situated between them and the cerebellum. No tuber is either placed above it or before it, and it gives origin, as usual, to the fourth pair of nerves.

Before the optic thalami, and under the posterior part of the hemispheres, there is a tuberule which corresponds to that we have remarked in birds.

The cerebellum is nearly hemispherical. The fourth ventricle penetrates a considerable way into its substance.

In the frog the hemispheres are longer and narrower. The optic thalami are larger in proportion to the hemispheres. Their ventricle is very distinct. It is the contrary in salamanders, which have the optic thalamus very small, and the hemispheres almost cylindrical.

The cerebellum of these two kinds of reptiles is flat, triangular, and lies posteriorly on the medulla oblongata.

In the serpents the two hemispheres form together a mass which is broader than long. The optic thalami are almost round, and one-half less than the hemispheres, behind which they are situated. The olfactory nerve has no apparent bulb. The cerebellum is exceedingly small, flat, and in the form of a portion of a circle.

In all these animals the inferior surface of the brain is nearly smooth. The optic thalami make no projection downward, and the pores de Varoli do not exist.

Cuvier assigns, as the distinguishing character of the brain in reptiles, the position of the optic thalami behind the hemispheres. And he states the following as the points in which reptiles, fishes, and birds, differ from the mammals. The want of corpus callosum, fornix, and their dependencies. Some tubercles, more or fewer, between the corpora striata and the optic thalami. The thalami containing ventricles, and being distinct from the hemispheres. The absence of any tuberle between the thalami and the cerebellum, as well as the absence of the pores de Varoli. Reptiles and fishes are distinguished from the mammals and birds by the want of the arbor vitae.

The brain of the tortoise has been delineated by Calderi, osservazioni intorno alle Tartarughe, tab. 2. fig. 5; that of the frog by Ludwig, de cinerea cerebri substantia; by Vicq d'Azry in the Mem. d'Acad. des Sciences, 1781; and by Ebel, in his Observat. Neurol. ex Anat. Compar., and that of the viper, by Vicq d'Azry.

Origins of the Nerves.—The olfactory nerves arise, as in birds, from the anterior extremity of the hemispheres. The optic nerves seem to derive their origin from a common eminence, situated under the middle of the hemisphere. The other nerves exhibit no particularities as to their origin.

Distribution of the Nerves.—The olfactory nerve proceeds to the nostrils in this class nearly in the same manner as in birds; but it is longer. The canal which receives it is partly osseous and partly cartilaginous. The two canals have only one common aperture within the cranium. The olfactory nerves of reptiles are generally much more fold than those of the preceding classes.

The two optic nerves are joined together, as in the mammals. There is nothing worthy of remark about the third, fourth, and sixth pairs.

Reptiles have the three branches of the fifth pair. In the first tortoises the ophthalmic palpes, some way, in the dura mater before it enters the orbit. It transmits filaments to the muscles of the globe of the eye, and particularly to the two lacrymal glands. The superior maxillary branch is the largest of the three. It is united to the inferior branch at its origin, but when it reaches the interior of the orbit, it separates from it to take another direction. It passes along the floor of the orbit, describing a very marked curvature, the convexity of which is external. A very great number of filaments proceed from the concave or internal
fide, which are lost in the lacrimal gland. The trunk is
afterwards divided into two branches—one internal, which
corresponds to the sphenopalatine and sub-orbital nerve.
It furnishes filaments to the palate and to the nose; and
when arrived at the anterior part of the orbit, it proceeds
outwardly and spreads upon the face. The other branch of
the principal trunk is external; it passes also upon the floor
of the orbit, to which it gives many filaments, and at length
issuing from the inferior part of the orbit, it expands upon
the face, analogously with the other facial nerves.

The inferior maxillary branch proceeds almost vertically
downward to the posterior part of the orbit, before the
petrous and articular processes of the os temporum. In its
course towards the lower jaw, it passes between the tem-
poral and pterygoid muscles, to which it sends several fila-
ments. Having arrived at the lower jaw, before the arti-
cular surface, it enters the oblong aperture, and divides in
the substance of the bone. It forms several branches on
the inner part of the jaw, which are lost in the muscles of
the tongue, and on the outside some others which ramify
under the skin.

The facial nerve exists in birds and reptiles, but its fize is
small, because these animals have no lips, and because their
mouth, as well as a great part of their face, is covered with
a horny or scaly substance, in consequence of which these
parts have but little motion or flexibility. We find, how-
ever, some of the branches: they are not indeed easily fol-
lowed in deflection, but their trunk always exists.

The auditory is united to the facial nerve as in the mam-
malia, and passes into a meatus auditorius, whence its
branches go into the ear. They will be described in the
account of the ear.

We have nothing remarkable to state respecting the par
vagus or eighth pair of nerves in reptiles. We observe
evidently that it is distributed to the lungs, the heart, the
oesophagus, and stomach, and that it forms plexuses on
these organs, in the same manner as the great sympathetic
nerve produces them round all the arteries of the trunk.

On leaving the cranium, the par vagus forms decussations
with the lingual and glossopharyngeal nerves; they after-
wards separate from each other: the glossopharyngeus is
posterior, the par vagum in the middle, and the lingual an-
terior. The par vagum does not always come out of the
cranium by a single hole; it is formed of two or three fila-
ments, which afterwards rejoin, upon receiving a communi-
cating filament from the glossopharyngeus, and one farther
down from the lingual; the nerve then augments somewhat
in diameter, and descends into the breast.

We have nothing to remark concerning the glossopha-
ryngeal and hypoglossal nerves.

Tortoises have eight pair of cervical nerves, which are
distributed nearly in the same manner as in mammalia.
The three last pairs join in forming the brachial plexus.
The green lizard has four pair of cervical nerves, but only the
two last enter into the composition of the plexus. In lal-
manders and frogs the cervical nerves cannot be properly
distinguished from the dorsal, as the animals have no ribs.
A pair comes out between the first and second vertebrae,
which is sent to the muscles of the inferior part of the neck,
and under the skin that covers them. These nerves also
afford some filaments to the shoulder. From this distribu-
tion they may be regarded as real cervical nerves. In frogs
only two pairs enter into the composition of the plexus. In
the salamander there are divinity four.

We refer to the tables which indicate the number of
the vertebrae in reptiles, in order to shew the number of
nerves which issue from their foramina. The distribution
of these nerves is the same as in other animals, and to point
it out would be only repeating what we have already de-
scribed in man.

Nerves of the front Limbs.—In the tortoises the three left
pairs of cervical nerves, and the first of the dorsal, proceed
to the thoracic member, where they form a plexus in the
following manner: the fifth cervical pafes behind the other
four pairs, crosses them in their course, and unites with them
in its passage. It then turns round the scapula, which in
this animal is articulated with the first dorsal vertebra. We
shall return to the description of this nerve. The sixth
cervical pair proceeds directly along the scapula on its in-
sert surface: it is crossed posteriorly by the fifth, and to-
wards the lower third of the scapula receives the seventh
cervical pair. The seventh is slender, crossed by the fifth
and the first dorsal pair, and united with the sixth, in the
manner we have pointed out. The first dorsal pair partly
joins the seventh cervical, almost at the point where it comes
out of the vertebral canal; it is then sent to the muscles of
the shoulder.

We shall now pursue each of the cords we have men-
tioned to their termination.

The large nerve produced by the fifth cervical pair, hav-
ing arrived behind and near the true articulation of the sac-
pula with the spine, divides into three branches: one, which
is but a filament, appears to be distributed to the articular
capule; a second, which is very flat, and from the fides of
which a vast number of lateral branches extend to the muscles
of the skin, appears to take the place of the musculo-cuta-
neus; the third branch, which accompanies the muscles of
the scapula under the skin, defends to the humerus,
without producing any remarkable branches. At this place,
however, it sends off several ramifications to the external
muscles of the far- arm. The trunk continues its direction
forward, expands and loses itself under the skin, and may
be followed as far as the hand: it may, perhaps, be re-
garded as supplying the place of the ulnar nerve.

The sixth pair of cervical nerves having, as we have
shewn, ascended in forming the brachial plexus, passes along
the internal surface of the scapula; about the lower third
of that bone it receives the seventh pair; the nerve then be-
comes thicker, but soon after divides into two branches:
the, which is slender, passes into the groove, between the
furca and the clavicile, and then spreads over the articular
capule of the humerus, after furnishing numerous filaments
to the muscles which surround it; the nerve may be regarded
as analogous to the articular in man. The trunk of the
nerve, which evidently supplies the place of the median,
on reaching the articulation of the humerus with the sac-
pula, transmits filaments to the adjoining muscles. On
arriving at the palmar surface of the scapula, it divides
into three portions, two of which are on the ulnar side, and
sink deeply into the muscles; the third, which is much
larger, follows the radial side of the far- arm, and at the
base of the thumb proceeds to the palm of the hand, and
detaches filaments to each of the fingers.

The seventh cervical pair unites, as we have flated, to
the sixth, at the posterior part of the scapula, to form the
median and articular nerves. We have, therefore, no oc-
casion to return to its description. The first dorsal pair
is lost in the muscles of the shoulder, and is not continued
throughout the arm.

The brachial plexus of the lizard differs a little from that
of the tortoise; it is formed by two dorsal, and the two
last cervical pairs: the first of the cervical furnishes only
one of its branches to the plexus; the other going to the
neck.
In the frog, the nerves, which are to be distributed to the arm, proceed from a very thick cord, which comes from between the second and third vertebrae; this makes the largest nerve in the whole body; it is soon after joined by a filament from the succeeding pair, with which it intimately unites; this cord proceeds towards the axilla; it sends off a branch, which passes above the shoulder, and is lost in the muscles of that part. The trunk continues its course to the arm, and very soon forms two principal branches, and besides these, it also sends some filaments to the extensors of the fore-arm, and the articular capsule of the head of the humerus.

Of these two nervous cords, one is directed forward upon the humerus, and represents the median nerve; it detaches some filaments to the muscles of the skin. Arrived at the fold of the fore-arm, the nerve plunges amongst the muscles, along with the tendon of the biceps, which supplies the place of the biceps; it afterwards divides into two branches, placed one above the other: the medial flender is situated between the flexor muscles of the fingers; the larger upon the furrow, which indicates the union of the two bones of the fore-arm; they pass under the ligaments of the carpus; having reached the palm, the superficial branch is lost in the skin, which covers that part, and the deep-seated is distributed to each of the fingers, nearly as in man. It also furnishes some filaments to the muscles of the hand.

The other cord represents the radial nerve; it turns round the humerus, and furnishes, in the first place, some branches to the extensor cubiti; continuing to descend round the humerus, it arrives before the articulation with the bone of the fore-arm; it is afterwards divided; one of the branches is lost under the skin, the other passes under the back of the hand, and terminates on the convexity of the fingers. From this description it will appear, that the nerves of the arm in frogs very much resemble those of the wing in birds.

In the salamander, the nerves of the arm are distributed as in the frog, but the brachial plexus is formed by two cervical, and two dorsal pairs, if we may regard as dorsal vertebrae, those which sustain rudiments of the ribs.

There are no brachial nerves in serpents.

**Nerves of the hind Limb.**—In lizards, there is only a small nervous filament, which proceeds from the femoral nerve, and supplies the place of the obturator. The femoral nerve is itself formed of the two lateral branches, and passes above the bones of the pelvis to be distributed in the muscles of the anterior part of the thigh. The sciatic nerve is produced by the three pairs of nerves, which follow, and which also receive a filament from the lateral branch; the only cord they form proceeds along the inside of the thigh, subdividing in the muscles, and extending to the toes.

The distribution of the nerves in the abdominal member is nearly the same in the salamander; there are no differences, except in the manner in which the plexus is formed. The femoral is produced by a single lumbar pair, which transmits a branch to the sciatic plexus, formed by the two succeeding pairs.

In the frog, three pairs of nerves enter into the composition of the femoral plexus, before which they run the whole length of the olla ili, which are very long; when arrived at the thigh, the plexus sends off a nerve, which corresponds to the anterior femoral; it is distributed in radiated filaments to the fore part of the thigh. The rest of the plexus proceeds into the pelvis, and forms a large cord, which passes to the posterior part of the thigh, and may be regarded as the sciatic nerve. A great number of filaments are afterwards detached from it to the muscles; about the middle and posterior part it divides into two branches, which pass under the ham, and represent the two popliteal nerves, the external and internal; these are afterwards distributed to the foot of the posterior leg, nearly in the same manner as to the human foot.

**Great Sympathetic Nerve.**—There is no description of the distribution of this nerve in reptiles, except in the mud tortoise; in which animal it was described by Cuvier. It is only distinct in the interior of the back-sheil; it has a disposition analogous to that of the cervical ganglion. The pneumo-gastric nerve, however, adheres to closely to it, that they cannot be separated; we did not perceive any filament on the neck, which could be regarded as the trunk of the nerve.

On the peritonium, and on the bodies of the vertebrae, there appear very distinct nervous ganglia, which are manifestly produced by the great sympathetic.

The ganglia are exactly similar to those of birds. There are two superior and two inferior filaments, which pass under the transverse processes of the vertebrae, that is united to the back-sheil; from the internal edge of each ganglion, a splanchnic nerve proceeds, which forms a plexus round each of the arteries produced by the aorta; one is also sent to affih in forming the pulmonary plexus.

This nerve may be very easily traced to the internal parts of the first vertebrae of the tail.

**Physiology of the Nervous System.**—The obvious differences of structure between the warm-blooded animals and reptiles, in this system; the exceedingly small brain and large nerves of the latter, contrasted with the slender nerves and large encephalon of the former, lead us to expect no less striking differences in their economy, than those which we actually discover. Are we to explain by this difference the little influence that the brain exerts over the other functions, and the great individual and independent vitality, if we may use the expression, of the parts, which appear in so many instances in the amphibia. The feverish injures, which in man or the warm-blooded animals would excite a sympathetic disturbance of every function, highly dangerous, and in most cases fatal, are borne with little apparent suffering, and restored with facility. (See the facts adduced in the physiology of the circulating system, to prove the tenacity of life in this class.) Can we explain in the same way the reproductive powers of this class? Blumenbach seems to consider the explanation sufficient. "The extraordinary strength," says he, "of the reproductive power in several amphibia, and the astonishing facility with which the procees is carried on, must be explained, if I mistake not, from the great magnitude of their nerves, and the diminutive proportion of their brain. The former parts are in consequence less dependent on the latter; hence the whole machine has less powers of motion and displays less sympathy; the mode of existence is more simple, and approaches more nearly to that of the vegetable world, than in the warm-blooded classes: but, on the contrary, the parts possess a greater individual independence. Since, in consequence of this latter endowment, stimuli, which operate on one part, or one system, do not immediately affect the whole frame by sympathy; as in warm-blooded animals, we are enabled to explain the peculiar tenacity of life, which is displayed under various circumstances in this class; viz. frogs continue to jump about after their heart has been torn out; and tortoises have lived for months after the removal of the whole brain from the cranium. The long continued power of motion in parts which
which have been cut off from the body, as in the tail of the water newt, and in fragments of the blindworm, may be explained upon the same principles." Handbuch der Naturgeschichte, ed. 6. § 98. p. 221.

The close connection between the brain, heart, and lungs in warm-blooded animals, in consequence of which the cessation of action in one very speedily stops the others, and consequently brings on general death, has been fully explained in various articles of this Dictionary; viz. DEATH, HEART, Lungs, Nervous System.

Observations and experiments have not yet been sufficiently multiplied, to enable us to understand all the minute connections with this subject. But obvious phenomena, which we have already alluded to, show us a vast difference in this respect between mammals and reptiles. The interruption of respiration, which is fatal in two or three minutes in the human subject, does not stop the action of the heart and brain until after some hours in reptiles. The removal of the heart, or of all the blood from the circulating system, does not prevent the action of the brain, and thus prove fatal, until after some hours. And, lastly, the removal of the whole brain, or decapitation, which, by interrupting the action of the muscles employed in breathing, is almost suddenly fatal in warm-blooded animals, does not very greatly affect reptiles. At least, they only seem to die from anoxia after the operation. Hence breathing cannot be under the immediate influence of the brain in these animals, for its interruption is fatal in a few hours. Le Gallois affirms that death follows much more quickly, when decapitation is effected below the occipital foramen, than above it, because in the latter case the part of the brain is left, which has the power of being necessary to respiration; viz., the origin of the eighth pair. (See his Expériences fur le Principe de la Vie, p. 42.) He does not, however, afford us the materials of drawing any accurate comparison, and he allows, that when decapitation is performed in the first vertebra of the neck, the animal survives the operation much longer than it can survive the interruption of respiration. He says, that salamanders live three or four months, and seem to die only from anoxia, when decapitation has been performed above the foramen magnum.

To the small influence of the brain upon the nerves, Blumenbach is inclined to refer, in some degree, the low temperature of reptiles. Although he considers it now as certain, that the lungs are the source, and the oxygenous part of the atmosphere the material, whence the heat of living animals is derived, he ascribes to the action of the nervous system a considerable influence in exciting and supporting the circulation of animal heat. Specimen, p. 22.

The brain seems to excite as complete and prompt a dominion over the voluntary muscles in these, as in warm-blooded animals. Their motions are equally lively, and the force of contraction does not seem at all inferior.

We know of very few facts that throw light on the intellectual faculties of reptiles. Yet there is sufficient evidence of their poifling memory and a capability of instruction. The frog and tree-frog can be taught to feed from the hand; and acquire a flight attachment to their maller. (Daudin, v. 8. p. 88.) The rattlesnake, the hooded-snake (col. naja), the box, and the coluber matrix in Europe (at least commonly in Germany), are taught to dance, and exhibit various motions at command. (Konzempfer, Animitates Exoticae, p. 556.) In the historical accounts of the religion of ancient Egypt, we learn that the priests of Memphis bred up crocodiles in their temples, and succeeded so far in depriving them of their ferocity, as to employ them in religious ceremonies. Besides the accounts of Herodotus, Strabo, &c. on this subject, we have the authority of a respectable eye-witness concerning very surprizing successes in taming a crocodile; see J. Greaves's Miscellaneoua Works, p. 252; and for the like successes in the common toad, see Blumenbach, Specimen, &c. p. 27. We know not on what grounds the serpent gained his character for wisdom, intelligence, foresight; why he was selected as an emblem for the gods of prudence, or chosen by the Epidaurians as the representative of Eflacarius.

Of the artificial instincts, which are so frequent in the mammals and birds, not even a trace is to be met with in the whole class of reptiles.

There is no regular sleep, or intermission of activity, in the organs of respiration and voluntary motion, recurring at stated intervals, in reptiles: unless, perhaps, in the turtles, of whom it has been reported by some.

Winter sleep, on the contrary, seems to prevail through the whole class. Herodotus observed this of the Nilotic crocodile, which, he says, pales four months of the winter without eating. Catelby has remarked it of the crocodile of Carolina; and Lacoudernier reports, that those of Louisiana betake themselves to the muddy marshes when the cold comes on, and remain so torpid that they may be cut without frowning the slightest. But the warm days of winter re-animate them. Journal de Physique 1785, t. 20. p. 333.

No animals, except insects, are so senile as to sleep as reptiles. The warmth of the sun seems to give them new life; as it increases, their viability and agility are augmented. Cold, on the contrary, numbs them, and would be actually defoliating, if they did not withdraw from its pernicious influence. They retire into the crevices of walls or rocks, the hollows of old trees, holes in the earth, or the bottoms of ponds, &c. to await the return of the genial season. The phenomena of this winter sleep are the same in reptiles, as in warm-blooded animals. The suspension of the actions of the nervous system is followed by an universal torpor of the other functions. As the brain and the organs of voluntary motion become inactive, the circulation languishes, respiration is barely continued, and vital temperature is reduced to the lowest degree.

Spallanzani found that when the temperature was reduced to 10° below zero, the heart of a serpent beat only twice in a minute, and respiration was suspended. (Rapports de l'air avec les etres organises, t. 1. p. 230.) In a temperature of 2°, the heart soon recovered its action, and beat ten or twelve times in a minute: in still higher temperatures, the pulsations were 25 or 30 per minute. (Ibid.) In the lethargic state, these animals changed the air very little. Frogs became equally lethargic in reduced temperatures: the heart beating very slowly, and the air being slightly changed. Ibid. p. 470.

Cold appears to be the immediate cause of this winter torpor; hence both reptiles and warm-blooded animals may be preferred in situations artificially warmed throughout the period of their winter sleep, without becoming torpid; but if the torpidity has commenced, they cannot be artificially awakened without danger. It is well known that the salamander, the water-nurt, the tree-frog, and the alpine marmot, may be kept awake through the winter in a room warmed by a stove. Gleditsch witnessed the fatal effects of violent excitement in the winter sleep in the frog (Mem. de l'Acad. de Berlin, 1762, p. 15.): it has been observed also in the marmot, the dormouse, and the swallow.

It may be remarked further, of warm-blooded animals, as well as reptiles, that some species assemble together, and are gregarious in their torpidity, while others are solitary. The
REPTILES.

The bat, swallow, frog, and salamander, exemplify the former.

Organ of the Sense.

Organ of Vision.—Reptiles, like all vertebral animals, have two moveable eyes occupying the cavities of the head called oribits, and project in their structure the same essential parts as in man. Their structure has not been much invesigated: there is none information in a memoir of Petit, in the Acad. des Sciences, 1737; and an account of the tortoises in Caledi.

They occupy the sides of the head, except in the crocodile, where they are placed above, between the cranium and jaw.

In the proteus they are covered by the integuments, and thus concealed until the latter are removed: this animal is, therefore, like the zemi or mus typhlus among mammalia, and consequently blind. All other reptiles have the sense of sight, and some possess even large and prominent eyes.

The tortoise has, at the anterior part of the sclerotic, similar ocellous lamina to those of birds. They are included in that membrane, without being continued into its substance, and may be easily separated from it. There are similar laminae in the camel and several other lizards, but they do not form the anterior dish, they merely surround the lateral part. Daudin has found this structure in the common iguana, and the great tupinambis of America.

"In the tortoise," says Cuvier, "the ciliary processes project so very little, that we could scarcely recognize them, were it not for the elegant impression they leave on the vitreous body; but in the crocodile these processes are very beautiful, and very conspicuous: they are each terminated by a nearly right angle. I have observed these processes in the form of elongated threads in a large foreign tree-frog; there are also such, though not distinct, in the toad. I have not observed them in the common lizards, nor in the serpents.

"The iris of reptiles resembles that of fishes in its golden colours; sometimes it is red or brownish. The vessels are more visible than in fish; they form a beautiful net-work on the iris of the crocodile.

"The figure of the pupil varies; in the crocodile it is vertically oblong, as in the cat: in frogs rhomboidal. The tortoise, camel, and common lizards, have it round; the gecko rhomboidal.

"The optic nerve in all reptiles passes through the membranes of the eye directly, and by a round hole, as in quadrupeds; it forms internall a small tubercle, from the edges of which the retina proceeds.

"The corneal lens is more spherical in the turtle and frog, than in the mammalia: the ratio of its axis to its diameter is in the former 7 to 9, in the latter 7 to 8: these proportions are nearly those which it has in fishes."

Muscles of the Globe.—There are six in the tortoise, disposed like those of fishes: and besides, four small ones, which closely embrace the optic nerve, and spread over the convex portion of the sclerotic, after being interrupted by the muscle of the third eye-lid. The same structure is found in the crocodile.

In frogs and toads there is a great funnel-like muscle, which embraces the optic nerve, and is divided into three portions: its inferior fibres advance more towards the edge of the eye than the superior. There is only a single straight muscle on the inferior part, and consequently only a single depressor. There is one very short oblique muscle attached to the anterior part of the orbit, and inserted directly into the adjoining part of the globe. The muscle of the third eye-lid is so close to the inferior part of the sphenofaryngeal muscle, that it becomes stretched when the latter swells; which accounts for the elevation of the third eye-lid when the eye is lowered.

Blumenbach remarks, that no instance of the leucæthiopic formation, or deficiency of the colouring matter of the choroid coat and iris, has ever been seen in reptiles; although it is so common in the two warm-blooded classes, and in the human subject. Specimen, p. 27.

Many reptiles fium the light, lying hid by day; and coming out to seek their food at night. Others appear very fond of light, whether that of the sun, as the green lizard and green frog; or of artificial flame, like that of a candle, as the tree-frog.

It seems peculiar to the camel to have the power of moving the two eyes at the same time in different directions; so that he is not necessarily obliged, like other animals, to bring the two optic axes into the same direction.

Eye-lids.—Reptiles vary singularly with respect to the number and disposition of their eye-lids: serpents have none; crocodiles and tortoises have three, and the third is vertical, as in birds: there are also three in frogs, but the third is horizontal like the other two. The third eye-lid is the part called membrana nictitans.

The crocodiles are remarkable for having bone in the upper eye-lid: in general there is only a single bit near the anterior angle; but in the crocodilus palpebralis the whole eye-lid is occupied by a plate divided into three pieces. See Cuvier in Annales du Museum, v. 10.

The horizontal eye-lids of crocodiles and tortoises close exactly; they have each an enlargement at their edge, but no cilia: the third eye-lid is semi-transparent; it moves from behind forwards, and may cover the whole eye; it has only one muscle, which is analogous to the pyramidalis of birds: it is fixed in the same manner to the posterior part of the globe inferiorly. After having turned round the optic nerve, it opposes under the eye to send its tendon to that eye-lid; but there are neither the mufculus quadratus, nor its sheath, as in birds.

In the other lizards there are also very remarkable varieties. The common lizards have, for eye-lids, a kind of circular veil extended before the orbit, and perforated by a horizontal fissure, which is capable of being closed by a sphincter muscle, and opened by a levator and depreflor; its inferior part has a smooth round cartilaginous disk, as in birds; there is, besides, a small internal eye-lid, but it has no proper muscle; it is merely wanting in the camel, in which animal also the slit of the eye-lids is so small, that the pupil can scarcely be observed through it. The gecko has no movable eye-lid; its eye is protected by a flight margin of the skin, as in serpents. A similar disposition seems to prevail in the seink.

Blumenbach has examined more particularly the structure of the part which covers the front of the eye in serpents. "These animals," he observes, "are commonly said to throw off the external layer of the cornea with the rest of their epidermis when they change their skin. On examining this matter more minutely in the coluber natrix, I find that that part of the epidermis, which is perfectly transparent and stretched before the eye, is not actually connected to the cornea, but separated from it by a small quantity of water. It is immovable, so that the globe moves behind it, as behind a window." Specimen, sec. p. 26.

In frogs and toads the superior eye-lid is only a projection of the skin, and almost immovable; the inferior is more movable, and has a swollen edge; but the third, which moves from below upward, is most employed by these animals:
mals; it is very transparent; it has one muscle situated transversely, behind the globe, which forms a thin tendon on each side of the eye, to be inserted into the free edge of the third eyelid.

The salamanders have only two eye-lids, which are horizontal, fleshy, and little moveable; it appears that they may entirely cover the eye.

Reptiles vary as much with respect to their lachrymal glands as to their eye-lids.

The sea turtles have a very considerable gland at the posterior angle; it is reddish, granulated, divided into lobes, and extends under the arch which covers the temple.

In the fresh-water turtles we find two small blackish glands, which also exit in toads and frogs; but their excretory ducts have not yet been accurately observed.

Serpents, like fishes, have no gland in the eye; they have, however, a peculiar structure near the eye, the office of which is not very obvious: the following account of it is given by Sir Everard Hume.

"An oval cavity is placed at the inner angle of the eye in some serpents, the opening into which is within the inner angle of the eye-lid, and directed towards the cornea. In this opening there are two rows of projections, which appear to form an orifice capable of dilatation and contraction. These cavities are lined with cuticle, which is shed with the rest of that integument. From the situation of these oval cavities, they must be considered as organs for a fluid, which is occasionally to be spread over the cornea; and they may be filled by the falling of the dew, or the moisture shaken off from the gills, through which the snake passes."

Phil. Trans. 1804, p. 75, with a figure.

Organ of Hearing.—Such an organ is possessed by all reptiles. Its construction varies considerably in the different orders and genera: these varieties affecting the external or accessory parts, as the tympanum, officula, &c. more than the essential portion of the organ, its membranous labyrinth, on which the auditory nerve is expanded. No reptile has any external ear; and the crocodile affords the only example of a kind of external meatus. Frogs, toads, and goats of the lizard kind, have a tympanum and Eufacchian tube; but these parts are wanting in the salamander, and most of the serpents. The ear of the turtle, toad, frog, lizard, and serpents, are described and delineated by Brunelli in the Comment. Inflit. Bonon. v. 7. Comparetti has exhibited figures of the same subject in his Observations Anatomicæ de aure interna comparata, Patav. 1789, 4to. Scarpa has given most beautiful engravings of the ear in the turtle, crocodile, green lizard, salamander, viper, and blindworm, in his Disquisitiones de Auditu et Olfaecì.

The Labyrinth.—The membranous labyrinth of the ear, in reptiles, is, in general, composed, as in fishes, of three canals and a sac; but there are some species which have an additional part.

In the salamanders, whose ear, like that of fishes, consists of the labyrinth only, the three canals are situated above the sac; they are deflected superiorly, and form together a triangle which is almost equilateral; each has its ampulla, and the sac contains a body of the consistence of flax, as in the rays and thorns.

Frogs and toads differ very little from salamanders, with respect to the membranous labyrinth; they have the same parts in the same position, and their sac also contains one amylaceous substance; their three canals form nearly a complete circle, by their junction with the sac.

Crocodiles and lizards have also three canals, but they are larger, and each approaches nearer to a perfect circular form: the sac is situated proportionally more within the head; its membranous paries are furnished with several blood-velvets, which are particularly conspicuous in the crocodile. The solid parts it contains are three in number, and they are smaller, and even softer, than those of the chondropterygious fishes. Lastly, their labyrinth is rendered remarkable by having an additional part to those we have already described: this is the first vestige of the cochlea; it is the production of the sac, in the form of a cone slightly arched; it is directed, under the cranium, towards the middle line, and is divided into compartments, or rather canals, by a double cartilaginous septum; one apartment communicates with the sac; the other, which is a continuation of the first, reflected on itself, terminates at a very small hole, which is closed by a membrane that separates it from the cavity of the tympanum.

This organ is precisely similar to that which is found in all birds. Comparetti was the first who described it in lizards. It is very large in the crocodile, and may be easily prepared from young subjects.

It is more difficult to find this in the cameleon and the marbled lizard. A vestige of it may be observed in the serpents. The production which may be compared to this trumpet, or rudiment of the cochlea in the turtle, is very similar to the part we named the sac, strictly so called, in fishes; and this resemblance confints not only in its form, but in the small amylaceous substances it contains; this forms to leave no doubt of the analogy between the sac and the cochlea in man, or of that between the part we call the sinus, and the vestibule. We must, therefore, judge of the perfection of the labyrinths of these different cars, by the degree in which the cochlea is developed.

Tortoises and serpents have the semi-circular canals, like other reptiles. In the tortoise they are proportionally very short.

The offious labyrinth of reptiles resembles that of the chondropterygii; that is to say, it envelops the whole of the membranous labyrinth, but in a manner more or less closely.

In the tortoise, the septum, which separates the vestibule from the cranium, is not officed; it remains partly membranous. The membranous semi-circular canals are much smaller than the bony cavities containing them.

In the crocodile and other lizards, the offious labyrinth closely embraces the membranous, or completely covers it by a thin and hard lamina.

Cavity of the Tympanum and its Appendages.—Among reptiles, the salamander has the labyrinth completely inclosed within the cranium, and deprived of all external communication, as in the fishes that have fixed branchio. But the other genera of the same order have a fenestra, called oval, supporting an offious plate, analogous to the bone called flaves in man. The lizard genus has another aperture, closed only by a membrane, and called fenestra rotunda.

The barrel, or cavity of the tympanum, cannot be said to exist in serpents: the flake of the plate, filling the fenestra ovalis, is surrounded by the flax, and its extremity touches the flax, near the articulation of the lower jaw.

In toads and frogs, the whole of its posterior part is membranous; it communicates immediately with the back of the mouth, by a large hole, which may be seen on opening the mouth of the animal. It is very small, and almost entirely membranous in the pipe, in which the labyrinth is connected with the fenestra ovalis by only a very long canal.

It is also membranous posteriorly and inferiorly in the common lizards, and in the cameleon: it communicates with the bottom of the palate by a short wide canal.

The
The barrel of the crocodile may be divided into two parts: one external, which is very wide, and closed on the outside by the membrane of the tympanum, and the skin, but entirely surrounded by the bones; and one internal, which is separated from the former by a contraction, and which communicates with the two fenestrae, and with some cavities analogous to the mastoid cells of man, but much larger. One of these cavities is placed between the semi-circular canals, and the other is directed backward and outward. The barrel is situated towards the superior part of the cranium.

The cavity of the tympanum in the tortoise is placed more laterally: it is not so wide externally; and the contraction, which separates the external part from the internal, is less conspicuous, because the projection, which it forms, is rounded, and not acute, as in the crocodile. The internal portion is prolonged backward, in the form of a large round cell: in the bottom of the cavity, opposite to the membrane of the tympanum, there is a narrow canal, in which the officulum is sunk, and which communicates with the fenestra ovalis. The Eustachian tube is a canal of a moderate length, which proceeds downward, and a little backward, and terminates in the palate, behind and within the articulation of the jaw.

The Membrana Tympani and its Osseous Frame.—Animals which want the barrel of the tympanum, as fishes, salamanders, &c, have no membrana tympani. That membrane is also wanting in several reptiles that have a barrel, as the chameleon: the skin passes over the external aperture of their ear, without undergoing any change, either in its thickness or its structure; and the existence of the organ of hearing can only be ascertained by deflection. On removing the skin, and some portions of the muscles, we find, in some species, and particularly in the slow-worm (anguis fragilis), a kind of membranous expansion.

In the tortoise, the large external aperture of the barrel is closed by a very thick cartilaginous plate, which is itself covered by a calyx skin, perfectly similar to that of the reft of the head.

In frogs and toads, the membrana tympani is on a level with the head, and the skin that covers it becomes finer, it is rendered perceptible by an oval spot, which is smoother than the rest of the head, and usually of a particular colour.

In common lizards, the membrana tympani is also level with the head, but very thin, smooth, and transparent; for at that part the skin becomes as smooth and fine as the cornea of the eye.

In the crocodile, it is of the same nature, but more fink into the head, and covered by two fleshy lips, which supply the place of the external ear.

In lizards, though the point of the cone formed by the membrana tympani projects less than in birds, it is also directed outward, as in them. The membrane is nearly plane in frogs and tortoises.

The membrana tympani is on a level with the adjacent parts of the head, and consequently is nearly vertical in all animals in which its situation is superficial; but in those which have it fink, its inclination, whether considered with relation to the head itself, or to the external meatus, varies considerably.

In the crocodile, it is a regular oval, the great axis of which is directed obliquely backward.

Officula Auditis.—The frog and the toad have two officula in the ear: one supplies the place of the maleus and the incus; it is attached to the membrana tympani by a slender branch, which forms an acute angle with the part that passes into the barrel: that part has the shape of a club; its internal extremity is the thickest, and articulates by a double surface to the second officulum, which corresponds to the flaps. The latter has a semi-elliptic form, and is applied to the fenestra ovalis by its plane surface: both of these bodies, which are ossified in other animals, are cartilaginous in the frog and toad.

Lizards and tortoises resemble birds, in having a single officulum with a thin hard flank, and an oval or triangular plate (columella). It is attached to the membrane of the tympanum in lizards, and particularly in the crocodile, by a cartilaginous branch; but in the tortoise, its outward extremity is directly implanted in the cartilaginous mafs, which corresponds to the membrana tympani itself.

In the crocodile, the plate is an elongated ellipse, the great axis of which is situated longitudinally.

In the tortoise, the bone is enlarged in the form of a trumpet, and is applied to the fenestra by a regularly oval and concave surface.

Serps have an officulum, but no membrana tympani. Its external extremity touches the bone that supports the lower jaw: it is surrounded by the flesh, and is applied to the fenestra by a concave plate, the edges of which are irregular.

In the chameleon, the plate also represents the wide end of a trumpet; its flalk becomes cartilaginous, and is lost in the flesh.

The fenestra vestibularis of salamanders is closed only by a small cartilaginous operculum, which has no, att and is concealed by the flesh.

Muscles of the Officula.—Little is known about these in reptiles. It appears that serps, chameleons, and salamanders, are entirely destitute of them, and that they are very indistinct in the tefudines. Comaretti has made some researches on this subject, but without any clear or satisfactory results.

External Meatus, &c.—All parts of the ear, external to the membrana tympani, are wanting in reptiles. In the crocodile only is there any appearance of an external meatus, the skin forming a kind of lip or operculum above the membrana tympani: the latter is entirely concealed, except when this covering is removed. This must be the part mentioned by Herodotus as the external ear of the crocodile, to which the Egyptians attached rings.

Distribution of the Nerves.—In reptiles and fishes, but especially in the latter, we can observe, still better than in warm-blooded animals, the constancy with which the branches of the auditory nerve proceed to the ampullae of the semi-circular canals. In reptiles it divides before it passes into the osseous labyrinth, which it enters by several holes.

Organ of Touch and Integuments.—It does not seem clear that reptiles possess the faculty of touch, that is, the power of reviewing, by any parts of their skin, the figure, hardnes, or softness, roughness or smoothness, of bodies. To the impressions of heat and cold, there is no doubt of their being sensible.

In no clas do we observe so much variety in the nature of the integuments; the skin is different in almost every species. In many the structure is so singular, that if we judged by this alone, we should form them into separate classes. What
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a contrast does the shell or bony case of the tortoise form to the smooth skin of the tree-frog; how different are the annulated skin of the amphibians, the scaly covering of other serpents, and the integuments of the toad, rough and tuberculated.

\textbf{Epidermis.}—When we examine what parts of the body are covered with skin in the tortoise and turtle, we can recognize it at first sight only on the head, neck, limbs, and tail; the other parts exhibit to us merely an offceous box or exterior skeleton, inclosing the body. But, if we examine more attentively, we shall find this skeleton covered by an extremely thin epidermis, which may be detached in transparent laminae, similar in figure, to the horny plates, and varying in its consistence in the different species. It resembles a smooth and transparent parchment in the testudo centrata of savages (Daudini, t. ii. p. 153.) The epidermis covering other parts of these animals is a smooth thin layer, not essentially different from that of the frog and falamander, and detached in threads several times in the year.

The epidermis of the falamander and frog is a thin, smooth membrane, covered with a mucous secretion; which answers a particular use in some kinds, as the rana calamita, enabled by its assistance to adhere to the smoothest bodies. This secretion, a simple and innocent mucus, is very different from another, which is found in many reptiles, pollelling extremely powerful sensible properties; the latter is described under the head of peculiar secretions, in the latter part of this article.

The thin transparent cuticle of the frog, falamander, and newt, is very frequently changed, being detached in large portions. Blumenbach states that this change takes place in the summer months at least once a week. Specimen, p. 26.

The epidermis of lizards covers all their scales, and is detached in small dried portions, or in larger pieces. It forms also a thin continuous stratum in serpents, enveloping the whole surface, and spread over every scale and plate. It is detached annually, at a certain season, in a single piece, like a sheet. The calf skin (ough, exuviae) is turned inside out, so that its exterior surface is the part previously in contact with the true skin. The animal escapes at the mouth, which is the only opening by which it can get out of the sheet. The part corresponding to the jaws is first detached, and turned back, so as to expose to the sun, covered by a new skin. As the head passes beneath the fold of its sheath, the latter goes backwards in the same proportion towards the tail, and is thus at last completely inverted. The transparent piece corresponding to the eye (see an account of the eye) has its concavity outwards.

\textbf{Rete Musciform.}—In all reptiles there is, under the epidermis, a mucous tissue, of which the colours vary very much. In the tefudines, for instance, the skin which covers the feet and neck is not only differently coloured by the rete musciform, but the symmetrical spots, which we remark on the scales, are produced by the same substance. This we discover by dissection. The thickness of the skin greatly diminishes as it approaches the breech-plate and the back-sheil. It palest below the scales which cover those parts, and which are, themselves, covered by the epidermis and rete musciform; the variegated colours of which form the spots which we observe through the transparent parts. A rete musciform is equally found in the lizards, serpents, falamanders, frogs, &c. It is variously coloured in each species; and it presents often the most beautiful and charming tints. We find in this class almost all the known shades, even blue, bright red, orange, pearly, gold and silver.

Reptiles are remarkable for the changes of colour which they exhibit, according to the season or climate in which they live, or to temporary affections of various kinds. In this way the cameleon has been most celebrated, and has afforded a very fine subject to poets and moralists. The changes are, in reality, very remarkable, and are particularly noticeable when the animal passes from the shade into the sun, or vice versa, when he is touched, or any thing placed round him, &c.

This property, however, is, by no means confined to the cameleon. Brown long ago observed it in several species of lizards (Natural History of Jamaica, p. 452.) and it occurs also in reptiles of these climates. The green iguana, the agama, and the green lizard, are sometimes green, sometimes brownish in their colour. The former is particularly observed in the copulating feon; and is lost in the cold and rainy parts of the year. The common tree-frog of Europe exhibits various tints from the brightem green to grey, blueish, violet, or brown. Other frogs and falamanders change their colours also, particularly about the copulating season.

\textbf{The Papille.}—Reptiles resemble birds with respect to the papille; we find none except under their feet; they are very thick, and projecting in several species of lizards, and particularly in the cameleon. We cannot distinguish them in the sea tortoise, which have the feet in the form of fins. They do not exist in serpents, or at least have not the form of papille.

\textbf{Cutis.}—Reptiles which have the body unburnished with scales, or only partly covered by them, have a very compact and dense skin. We have an example in the tortoises, falamanders, frogs, and toads. In the two last genera, in particular, the cutis is rendered remarkable by not adhering to the body in all its parts, as in the other animals, in which it is intimately united with the cellular substance. In these genera, however, it adheres only at the edges of the mouth, in the middle line of the body, the arm-pits and the groins. In all the other parts the body is free within the cutis, which includes it like a sac.

In lizards and serpents we find, as in fishes, a strong cutis under the scales, even adhering very closely to the muscles.

\textbf{Cutaneous Muscles.}—There is no cutaneous muscle on the trunk of frogs, because the skin does not adhere to that part of their body. Under the throat, however, we find several fibres, which are attached to the margin of the jaw, and inserted into the cellular substance that unites the skin to the origin of the breath.

In totoises the cutaneous coli is very visible, and seems to be formed of two parts; it is extended from within the concavity of the lower jaw to the bottom of the neck, at the anterior part of the brecat-plate. A middle cellular line unites it with the muscle of the other side; it takes its origin from the transverse processes of the cervical vertebrae. Being spread over all the muscles of the neck, it serves as a girdle to them; in its lower part it is perforated by the sternomastoideus, which, as we have already observed, arises from the lateral parts of the breast-plate.

\textbf{Secretions of the Skin.}—Among reptiles, totoises, toad, that have scales, as snakes and lizards, have the skin almost dry; but toad with naked skins, as falamanders and frogs, have the surface of the body always copiously lubricated with viscous matter.

Toads and falamanders have even the power of augmenting the secretion of this liquor, and of making it exude, like a dew, through the pores of the skin.

The cutaneous glands are more visible in cold-blooded animals, than in the mammalia.

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The galamanders have several glands ranged along the back, which form elevations or lumps on the skin.

The toads have them scattered irregularly on the whole surface of the body; we observe, in particular, two which are very large, behind their ears; these glands produce an acid humour, which is a poison to very small animals.

In lizards, we observe a very regular row of small pores, which also yield a viscid humour.

Absorption of water by the skin of the frog.—Townson found that the frog, and tree-frog, when placed on a moistened paper, could absorb the moisture so rapidly, as nearly to double their weight in two hours, under certain circumstances. He states that they do not drink, but take in all their fluid in this way. (See his tracts and observations in natural history.) Daudin has verified the observation. He kept two frogs without any fluid for seven days, and then placed them in a bottle on moistened sheets of paper. In two hours they had nearly doubled their weight. Hist. Nat. des Reptiles, tom. 1. p. 115.

Fingers.—The number of the fingers, and their flexibility, vary more in reptiles than in all the other classes.

Common lizards have, in general, five fingers, of different lengths, well calculated to embrace objects in every direction. Some, as the crocodiles, have them palmed, at least in the posterior feet. Others, as the gecko, have them invected inferiorly with imbricated scales.

The camelion has them united by the skin, as far as the nails, in two parts, which form the forceps. The skin of their inferior surface is furnished with febile papillae. The long lizards, called feps and chalidces, have only three very small toes. The galamanders and frogs have them naked and deftite of nails. In tree-frogs, the extremity of the toes is enlarged into a spongy disk, capable of adhering with force to bodies. In tortoises, the toes are palmed. Lastly, the ferpents are completely deprived of feet and toes.

The long separate toes of the batracian order, and of several lizards, seem well enough calculated to serve as organs of touch; they might be applied to objects, and would surround them in various ways. They fper, however, to be employed merely as instruments of motion.

"It has been said of ferpents (observes Blumenbach), with more ingenuity than truth, that their whole body is a hand; by which they gain just notions of the tangible properties of bodies. There is much more foundation for stating that the f彭e of touch, which is here meant, does not exist in any of the amphibia." System of Comparative Anatomy, p. 310.

Among the reptiles the scales vary greatly, according to the genera. In tortoises they are plates of a horny substance, which are very hard and dense in the greater number. But in the tetudo coracica, and several others, they are soft and flexible; sometimes these scales are imbricated, as in the hawk's-bill turtle; and then they are smooth, or channelled longitudinally; at other times they form compartments of different figures: in the latter case they are more or less convex, and surrounded with furrows, or concentric channels, in the midst of which are points, which are either feabrous, elevated, or blunt, as in the species named geometica, greca, &c.

In the crocodile the scales are bony, arranged in transverse bands, and situated, in respect to each other, like the stones of a pavement. In the other lizards and ferpents they confit of horny substance, and present almost every possible variety of form and arrangement.

Organ of Smelling.—This is less completely developed in the amphibia than in the two warm-blooded classes of vertebral animals. The f彭e of smelling is the most imperfect of the Vol. XXIX.

f彭es in this class, says Daudin, if we may judge by the structure of the nostrils. Reptiles do not seem to employ their smell in discovering or selecting their food, or for any of the purposes to which the faculty is subfervient in other animals.

We find, however, in the whole class, nasal cavities opening on the snout in front, and on the palate behind, lined with a vascular pituitary membrane, on which olfactory and nasal nerves are distributed.

There are also different projecting laminae within the nofe; but they consist of folds of the internal membrane, and are not sustained by osseous parts. The tortoise has three laminae, which divide the nasal cavity into several foffices. The middle one corresponds to the external aperture of the nostrils; between it and the next there is an oblique canal, which leads to the posterior nares. We find only some tubercles in frogs, and other small species. It does not appear that any references have been made respecting the parts in the crocodiles.

The olfactory nerve differs in reptiles little from that of birds, as to its origin and course; it differs less in its distribution, since it only divides, according to Scarpa, upon the septum, and the membranous fold corresponding to the superior turbinated bone, without proceeding farther. The external nares of reptiles, more or less approximated, and susceptible of contraction and dilatation, are usually furnished with only some fliehy frata, which dilate or contract their entrance. This is observable in the greater number of lizards, which differ from each other only as to the position of their external nares. They are clofet to each other in the crocodiles. The tupinambis, the fellungen, and the camelions, have them more removed, and situated more laterally. In the galamanders they are exceedingly small. In frogs we observe a small tube, the motion of which is very apparent, because it is extremely useful in respiration, as we have already known. The tortoises have also two very small approximated nostrils. In the matamata, and one or two other species, they are situated at the end of a short cartilaginous proboscis. The external nofe is also rather elongated in some ferpents; for example, in the vepra ammodutes, and the colluber nata. In the rest of this order there are small lateral nares, capable of flight extension. In the rattlesnake, and some others, there is a small blind hole, near the nofe, on each side; we have described it under the head of peculiar organs. See Scarpa de Auditu et Olfaetu, for a description and figures of the nofe in the turtle and viper.

The Organ of Taste.—All reptiles possess a tongue, but whether they have the f彭e of taste is not so clear. As they all swallow their prey whole, there seems to be little room for the exercise of taste. We have already spoken of the tongue, in the account of the salivary glands; and have entered further into a consideration of its mechanism and moving powers in our description of the organs of mastication and deglutition.

Substance of the Tongue.—Reptiles vary greatly with respect to the tongue, as well as in many other circumstances. The tongue of toads and frogs is entirely fliehy, attached to the lower jaw, and, in a state of repose, inflected in the mouth.

In galamanders, it is attached as far as the point, which is not moveable, and the whole tongue is only free on its lateral parts. Crocodiles have it attached to the lower jaw, both by the edges and the point; and authors long supposed that this animal had no tongue. It is entirely fliehy in both these genera.

The fellungen and the iguanas have a fliehy tongue, which polettes nearly the same mobility as that of the mammalia.
The snakes and geckos differ only in having the tongue notched at the extremity; and in that respect it resembles the 'tongue of the slow-worms, to which, in general, the snakes are very much allied.

In common lizards, the typinamibis, or monitor, &c., the tongue is singularly extensible; it terminates in two long flexible points, though semi-cartilaginous; it completely resembles that of serpents, if we except the slow-worms and the amphibians, which cannot elongate their tongue, but which have it flat, and only forked at the extremity.

The cameleon has a cylindrical tongue, which may be considerably elongated by a mechanism analogous to that which takes place in wood-peckers.

*Structure of its Surface.*—The tongue of the tortoise is furnished superiorly with long, soft, cloe, conic papille, which give it the appearance of velvet.

In the crocodile they are very short, and represent rather flat rugae than papille. They form, on the contrary, a very distinctly villous surface in the iguanas and the felions.

The tongue of the cameleon is furnished with deep, cloe, and very regular transverse rugae; in the lizards, with extensible and forked tongues; and in the serpents, that organ is singularly smooth, and as it were, horny towards its points.

The salamanders have, like the iguanas, a fine villous surface to the tongue; but in the frogs and toads the surface is perfectly smooth to the eye, and always mucous.

No reptile has two kinds of papille, nor glands with a calyx.

*Peculiar Organs and Secretions.*—Many amphibia produce singular and specific odours, particularly when irritated. In the water newts the smell has been compared to that of chopped parsley; in toads to garlic; the crocodile there is a very strong smell of muck; and several tortoises have this muck-like smell. A singularly fetid odour is produced by the rattlesnake, when angry. May we suppose that this is a defence against hostile attacks, in the salamanders and water newts, as it seems to be in the viverrae, and some frogs?

It may probably serve in spring, as Blumenbach supposed, as a means of veneral excitement. For if, after handling female toads for some time, the hand is plunged into water, where there are male toads, they flock impatiently to the spot, and closely embrace the fingers. *Specimen*, p. 29.

The notion that this odour is employed by the rattlesnake to suffocate, nauseate, or in any way whatsoever to act on the animals which form its prey, is entirely ungrounded, as we have already explained.

There are generally manifest organs for the secretion of the substanctes in which these properties reside. Small granulated tubercles are seen under the thighs of the lizards, the chalicæ, and the marbled iguana of Surinam, and near the anus of the amphibians, producing, particularly in the coupling season, a fluid, and smelling like dry hay.

*Musk Gland of the Crocodile.*—It lies under the skin of the lower jaw, on each side, about its middle. It is a small gland, of a homogeneous whitish tiffue, and covered by a tendinous sheath. It secretes an opalescent blackish-grey fluid, smelling most strongly of musk, and collected in a small bag, which opens externally by a large orifice.

*Anod Gland.*—In some species it has been observed in the crocodile and alligator, as well as in several reptiles. They may be seen of considerable size in female crocodiles, under the tail behind the cloaca, in the part occupied by the penes of the males. They contain a thin yellow substanct. Tyfon has described them in the rattlesnake. Other snakes have been described as producing powerfully fetid odours from the mouth.

*Poisonous and Acid Secretions.*—There is a striking difference in this respect between warm-blooded animals and reptiles: none of the former produce any thing poisonous, unless we should make an exception concerning the liver of the urus arctos, which is described by Ger. de Veer, one of the unfortunate sufferers, to have been nearly fatal when employed as food by Heemskerk and his companions, compelled to winter in Nova Zembla. Blumenbach's *Specimen*, p. 30.

Besides the terrible poison with which so many reptiles are armed, already described in our account of the teeth, there are several more or less actively hurtful secretions in this class.

The glands or crypts under the skin, forming the cutaneous eminences in the salamander and toad, produce an irritating fluid, which they seem to have the power of excreting at pleasure. Blumenbach describes the acrimony of this fluid in the rana bombina, from his own experience of its effects. Having cut his hand while handling some of these animals, and applied it to his mouth to suck the wound, he found a caustic heat suddenly pervade the tongue and fauces, like what is produced by chewing the bark of the laurel; and it continued for several hours. *P. 24.*

It seems to be an analogous fluid in the salamander, by means of which this most innocent little animal, to unjustly deemed venomous, can extinguish a few coals when placed in them. But the contortions of the body sufficiently attested the pain produced by this cruel experiment, which is soon fatal, if prolonged. The fabulous notion of the ancients, that this little reptile can live in fire, is well known; and Benvenuto Cellini has ventured to assert the truth of it, on the faith of his own experiments. *See his Life.*

The notion of the salamander being able to live in fire is the more extraordinary, when we contrast it with the fact, that it has been found in cokes of iron, and after remaining frozen for some days, recovered. So that it can actually survive conglagation.

Dr. Barton of Philadelphia has named an aquatic salamander, which he found near that city, salamandra vennosae, from the nature of the fluid which exudes from the tubercles of its back. Daudin, *tom. viii.*, p. 229.

The gecko of Egypt produces a poisonous fluid of considerable activity. "It exudes (says Hallequin) from the lobules of the toes; the gecko seeks for places and objects impregnated with marine salt, and passing several times over them, leaves its venom behind." I law in 1750, two women and a girl, who nearly died in Cairo from eating chevè which had been thus poisoned. I had another opportunity of noticing the acrimony of this fluid, in the production of red, inflamed, and itching pustules on the hand of a man, who endeavoured to catch the animal." The French naturalists, attached to the Egyptian expedition, confirm the report of Hallequin. Daudin, *tom. iv.*, p. 110, 111.

*Rattle of the Genus Croalute.*—This singular organ consists of many pieces, from one to thirty, or more, perfectly similar, not only in form, but often also in size, composed of a brittle, semi-transparent, horny substanct, similar to that of scales. The piece immediately connected to the body forms a small sheath, moulded on the left vertebræ of the tail, which it includes, and from which it is separated only by a thin membrane. Its surface presents three circular ridings, corresponding to three elevations of the vertebrae of the rist, or nearest to the animal's tail, is the largest, and the two others decrease successively. All the pieces are enclosed one in the other, the posterior two-thirds of each being enveloped by the following. Of the three ridings or rings on each piece, the anterior only is visible, the two posterior
terier being concealed by the following piece. The last, or extreme portion, has all its three rings visible; and the organ consists, externally, of this piece, and the first rings of all the others. The two last rings of each piece, included in the two first of the succeeding, retain it in its place; but, as the diameter of the former is less than that of the latter, each piece is quite loose, and plays freely about that which it envelopes. None, except the first, is united to the skin of the animal, or connected by any muscle, nerve, or vesel; it is, therefore, merely an exterior covering, moved, as any foreign body would be, when the end of the tail is agitated.

The different pieces of the organ are formed successively on the skin of the tail, receiving from it the materials necessary for its development, and adhering to it until its growth is complete. A second piece, entirely similar to the first, is formed under it, and detaches it from the end of the tail. It is pushed backwards, leaving between its edge and the skin of the tail an interval occupied by the first ring of the new piece, of which the second and third rings are covered by the first piece. The latter is retained by this connection, but plays freely round the first piece. A third piece is formed under the second, as that was under the first; pushing the second backwards, but retaining it by its two posterior rings being included in the cavity of the second piece.

If the vertebrae of the tail continue of uniform diameter, all the pieces will be of the same size, and the rattle, consequently, is of one breadth throughout. On the contrary, if the vertebrae grow while the rattle is being formed, the pieces increase in size, and thus the rattle tapers to its end.

It is evident, from the preceding description, that one piece only can be formed at each partial moulting of the end of the tail; but we do not know whether these moltings coincide with the general separation of the epidermis from the body, nor the periods of their recurrence, the number of pieces not only affords no proof of specific differences, but also indicates nothing about the age of the animal. Lacépède, Hist. Nat. des Serpens, 12mo. t. 2. p. 217.

Horns, Et. of other Serpents and Reptiles.—The Egyptian cerafies is so named, from its two moveable, pyramidal, four-sided, curved horns, about two lines in length, placed above the eyes. They consist of successive frata, of which the exterior separates like an epidermis, exhibiting always four grooved sides. The exterior frata separates thus with the animal's skin, like the epidermis of the scales, which this resembles entirely in its texture. Lacépède, ibi supra, 1. t. p. 256.

In the batracian order, the horned frog has a conical horned elevation above each eye; and the rana margaritifer a peculiar hard critta on each side of the head.

The cecilia ibiara has two small tentacula or cirri, scarcely visible near the nostrils; and the serpent, which Lacépède has named erpeton tentaculé (Annales du Muséum, t. 2. p. 280.) has two fleshy appendages, covered with scales, extending from the end of the finot horizontally forwards. Is there any probability that these parts in the cecilia and erpeton are organs of touch?

Facial Pouches of Serpents.—A small bag has been observed in the rattlesnake, in sixteen colubres, and three boa, between the eye and the nostril; it has a rounded form, resting in a hollow of the bone, in shape not unlike the orbit. A small orifice behind the nostril leads to it. These bags, which are lined with cuticle, have their covering cast with the rest of the animal's skin. The cavities in question were noticed in the rattlesnake by Tyfon, Phil. Trans. v. 13. p. 106, and they have been since described and delineated by Dr. Ruffel and Sir Everard Hume. (Phil. Trans. 1804. p. 70.) The latter anatomist discovered nothing like a secretary apparatus about them, nor any thing that could lead to conjectures concerning their office. They appear most analogous, in situation and structure, to the small bags of the deer and antelope, called by the French lauriers. We conclude our review of the structure and physiology of reptiles with the summary of the principal differences between their economy and that of the warm-blooded classes, which terminates the excellent "Specimen" of Blumenbach.

"Et calidos quidem animalibus a prima inde formationis origine ad ultimum uique vitae habere l'appareil phlogistique ut bodie audit proceedit. Mammalium factum placenta adnimiculo, quae festa phlogifton materno elemento igne commutat. Pulso incubato poroae teetae et albuminis opus, quae in rem igne pabulo aditum, phlogifton vero superfluo exitum conce- dent. In lucem vero editis tum mammalibus tum avibus, perpetuo et alterno respirationis rhythmio.

"Interius porro huic phlogisticum procussi cum religius functionum clerkibus nexus, maxime cum circa s ofte nvolvi, ut hiberni mammalium veteri, phoenomis quae supra tenditum, verifilimus redditur.

"Ipfig porro nervosi s ofte nvolvisi functionibus conspiratio, pretectum ope reactionis senforii ab ea encephali portione pendente, que praeer originis nervorum super eff.

"Ex his omnibus ssummis quidem functionem vigor, mobilitas summa, hinc corpus vivum infinitis modis innumerorum, et multifariorum limularum impetu et imperfonibus susepiendis aptum: hinc prae ceteris omnibus summa hominis praerogativa, in quo, uti, pridem observante Hippocrate, confluix uno, conspiratio una, conferentia omnium, icta et omnium maximus et innumerus cum univera religia cum ambiente creatione nexus.

"Longe alla et contrario amphibiorum natura. Phlogistics proceelus noftratus perexiguis lentif- fimus.

"Debilis etiam in omnibus amphibiis fanguinis in ence- phali phlegos in fluxus.

"Exiguus porro parvi fenofoii in crasias nervas reactio.

"Minor hinc in univerum confenfus; minus unus func- tionis in alteram imperium.

"Minor hinc totius machina animata mobilitas.

"Vcrum eo major ab altera parte simplicioris illius vita tenacitas, quod parte una aesteta, s ytemate uno affinum, non tam facile relign in convenfum trahuntur.

"In univerum ergo vita magis vegetativa, reproducitio- ut per utramque organismum naturae regnum confat—longe magis opportuna, quam quae altioris ordinis facultates, contentibus, et complicat conspirations subtiletivate viget." P. 36.

Anatomical Description of the Proteus Anguineus, and Siren Lacertina.—See Cuvier, Recherches sur quelques Reptiles douteux, infértes in Humboldt's Recueil d'Observations de Zoologie et d'Anatomic comparée faîtes dans fon Voyage, 1. 1.

By the word amphibious, applied to animals, naturalists have meant to designate the power of living, and particularly of breathing, equally well in water and in air. In this sense it cannot be applied, with propriety, to any of the animals who have received the appellation from the ancients, and most modern naturalists. Without speaking of the otters and hippopotami, which are true aerial quadrupeds, we fit the water merely in search of food, the seals and cetaceous

animals,
REPTILES.

animals, compelled by their organs of motion to pass the whole, or nearly the whole of their life in water, can absolutely breathe air only.

All the reptiles to whom Linnaeus subsequently transferred this name of amphibious animals, are similarly circumstanced in their adult state; they can only breathe air, whether they live constantly in this element, as the lizard kind, or take themselves, for a longer or shorter period, to the water, as the frogs and salamanders. On the other hand, the cartilaginous fishes, which this same naturalist had joined to the reptiles, like all other fishes, can only breathe by the intervention of water; they have only gills; and it is by having represented as lungs the forked swimming bladder of some of them, that Dr. Garden caused the mistake of Linnaeus.

The larve or tadpoles of the batrachian reptiles only, that is to say, of the salamanders and frogs, the tree-frogs and toads, have both branchie and lungs; breathe, at least for a certain time, both in the air in its glacial state, and that which is contained in water; consequently participate equally the nature of aerial and aquatic animals; and may, therefore, without impropriety, bear the name of amphibious in its most strict acceptation. But with these it is only a transient, and with some perhaps only a momentary state. As their lungs are developed, their branchie are obliterated, and they entirely lose the latter, often even before reaching their full size, and particularly before they are capable of reproduction. Such, at least, is the result of observations on all the tadpoles of these climates, on all which it is possible to follow in their various developments.

But naturalists have observed three other animals, uniting, like our tadpoles, the two kinds of respiratory organs, not appearing to lose any of them at any epocha of their lives, and of such form and size, that it is said in the countries which they inhabit, no perfect reptile is known, of which they could be the larvae. Are these creatures perfect animals—true permanent amphibious? Should they be considered an intermediate class between reptiles and fishes? We proceed to examine this question, observing, in the first place, that the structure of the circulating organs in the common tadpoles, which has been described in a former part of this article, must be kept in view as a point of comparison.

Anatomy of the Siren Lacertina.—This animal is common in the rivers and marshes of South Carolina, and is remarkable for possessing only the fore feet. Dr. Garden sent an individual to Linnaeus, accompanied with a description, in which he mentioned the simultaneous existence of branchie and lungs, and declared that there is no salamander in Carolina large enough to have been produced from the fire. Hence Linnaeus determined to establish for it a particular order of reptiles, the amphibious. Nearly at the same time it was described in the Philosophical Transactions by Ellis, whose description was accompanied with an anatomy of the animal by Mr. J. Hunter. Yet several naturalists contested the result of these examinations. Pallas, Hermann, Schneider, and others, considered that it might be a larve. Camper, on the faith of an imperfect specimen, in which no lung could be found, concluded it was a fish, (Kleine Schriften, tom. iii. pl. 1. p. 20.) and Gmelin, on his authority, classed it among the cels.

Cuvier has had an opportunity of dissecting and describing it. His account, which settles the dispute satisfactorily, is contained in the Recherches already quoted, and has furnished the materials of the following description. The facts are represented in the 11th and 13th plates of the first volume of Humboldt's Recueil d'Observations de Zoologie et d'Anatomic comparée. The length was half a metre, but it reaches sometimes between 30 and 40 inches. The body is much like that of an eel. The anus is at 15 centimetres from the posterior extremity. The head is not separated from the body by a neck; it is rounded, and terminated by an obtuse snout. The mouth is small, and the lips, which are not considerible, are not supported by any bones, as they sometimes are in fishes. The nostrils are two small holes near the edge of the upper lip. The eyes are placed above the angle of the mouth; they are round, small, without eye-lids, and only visible because the skin, in passing over them, becomes transparent. You may skin the head, like that of an eel, without injuring the eye-ball.

The openings of the gills are three vertical slits placed in succession behind the head: through them the water from the mouth is discharged. But there are no gills within, as in the lamprey for example; although Garden, Ellis, and Camper supposed it. The only branchie are three tufts or fingers, attached to the superior angle of the slits, to which Ellis and Garden gave the name of opercula, but of which Linnaeus recognized the true nature. There are chiefly only three on each side, of which the first is the smallest, and the third the largest. The different statements concerning their number, which embarrassed M. Schneider, arise from the name having been given to different parts. For example, Linnaeus, who rightly deemed the tufts to be branchie, reckons three, without opercula (branchia ad latera collis utrinque tria, exerta); but Gardn, who conceived that the branchie were connected to the arches, says there are four, with three opercula, or one operculum of three lobes.

Each of the tufts consists of a large fleshy and conical pedicle, of which the inferior edge is divided into two rows of appendices, which are themselves again twice divided in the same manner. The animal must have the power of moving these branchie in every direction; the net-work of branchial vessels is expanded on their ramifications.

The fore feet, short and slender, are placed a little behind the branchial apertures. There are four fingers, of which the last phalanges are pointed, but not furnished with nails. There is not the smallest appearance of scales on the skin.

Ophthalmology.—Although the individual examined by Cuvier had not reached its full size, ossification was considerible advanced. The cranium, lower jaw, and spine, were perfectly ossified. On the large bones of the arms there were epiphyses, and the scapula was almost entirely cartilaginous. The latter bone remains constantly in this state in the salamanders. The branchial arches were entirely cartilaginous, and probably continue so, as no point of ossification could be observed, although the os hyoideum and its branches were already almost completely hardened.

From the head to the end of the tail there are ninety vertebrae: the anus is opposite to the forty-fifth, yet it is far from being opposite to the middle of the body, because the vertebrae of the tail, particularly towards its end, are much smaller than the others. The tail salamander has thirty-eight, and the aquatic about forty. The pelvis is suspended opposite to the fifteenth or sixteenth, in the former; to the fourteenth or fifteenth, in the latter. There is not the smallest vestige of pelvis or hind leg in the fire: there is not even any germ of these parts, although they exist in the tadpole at all ages. It is, therefore, very certainly never destined to have hind legs. There is a kind of imperfect pelvis, even in the chelidaurus (anguis verticlis, glâla-snake), a true serpent, though analogous to the lizards in some points, but never possessing hind legs.

Eight vertebrae only of the fire, from the second to the ninth,
REPTILES.

In the land falamander there are twelve or thirteen, and in the aquatic eleven. These small ribs, lost among the muscles, are only observed in the genus of serpents called cuculia, where they exist in great number.

The individual vertebrae are very differently shaped from those of falamanders, frogs, and cuculia. The body is terminated before and behind by a hollow cone filled with cartilage, which unites it to the adjoining bones, as in fishes. There is a small longitudinal prominence below; and above, a crest holding the place of the spinous processes, and bifurcated behind. The four angles of the surface are occupied by the articular apophyses, of which the anterior have their articular faces turned upwards, and the posterior downwards. The transverse processes are formed of two triangular plates: one, inferior and horizontal, comes off from the whole side of the body of the vertebra; the other slants backwards, and reaches from the anterior articular processes to the posterior edge of the preceding. At the extreme point of their union we find the surface to which the rudiment of rib is articulated, in those vertebrae which have ribs.

None of the allied genera resemble the sirens in the form of the vertebrae; and their singular shape would alone be sufficient to authorize us in constituting a separate genus for this animal. The head leads equally to the same conclusion, being entirely different from that of the falamander, and other reptiles. The nostrils, finely excavated at the sides of the snout, do not penetrate into the mouth; neither the orbit nor the temporal fossa is closed below. Hence the upper jaw-bone does not form a complete bony circle; its anterior part only is formed by the intermaxillary bones, and has no teeth. Thus the snout has only palatine teeth attached to the two plates, and not implanted in the palate. The prominence, having the surface for the articulation of the lower jaw, is much shorter than in the falamander. The lower is articulated with it by a convex surface, shaped like the segment of a sphere: its coronoid processes is very short; each of its branches is composed of three pieces at least. The teeth are attached to their internal surface, and not implanted in their edges. The head is articulated to the neck by means of two condyles.

The bony apparatus of the branchial resembles that of fishes, with a few slight differences. A longitudinal bony piece bears, at each of its extremities, a pair of transverse portions. Each of these anterior portions is joined to a cartilage, which ascends behind the head, furnished by a strong ligament to the ridges of the occiput: it is analogous to the piece which supports the radii of the branchiostegal membrane in fishes. But here there are no radii; and there is even a solution of continuity between this piece and the first arch of the branchia. This first arch, the largest of all, is joined to the posterior transverse piece mentioned above. The three others are joined to a third bony piece, similar to the preceding, but furnished behind it, and not articulated to the longitudinal piece. These four arches are simply cartilaginous. Their superior extremity is furnished to the second rib by a ligament, but not articulated to it. Their edges exhibit a series of small fine denticles, which border the three branchial apertures: the anterior edge of the first arch, and the posterior of the last, not concurring in the formation of any opening, have none of these denticles. The skin is immediately attached to these arches, and they support nothing, as we have already stated, analogous to the branchia of fishes. The tufts, which have no bone in their interior, are the only branchia.

The osteology of the legs is the same as in the fala-
then becomes muscular and contracted, and is narrower than the duodenum. The latter is the widest part of the intestine, which becomes smaller towards the anus. Although longer than the abdominal canal, and consequently forming several flight turns, it exhibits no great folds. There is no caecum, nor any remarkable change of structure to point out the distinctions of different kinds of intestine. The pylorus has no valve; the mucous membrane of the flomach is smooth; that of the intestine has papillæ like small scales.

The canal is supported by two parallel mesenteries, of which the right adheres to the whole length of the liver. There is no omentum.

The liver is black, elongated, and occupies more than three-fourths of the length of the abdomen. The gall-bladder is lodged in a deep groove towards its middle, and furnishes a single canal, opening into the intestine a little beyond the pylorus. No duct could be perceived coming directly from the liver, but such a one might have been confounded with the numerous mesenteric vellies.

A slender and very long spleen is attached to the mesentery of the left side, and occupies more than three-fourths of the length of the abdomen.

**Organs of Generation.**—The individual examined by Cuvier was a female. The ovaries were considerably developed, about one-fourth of the length of the abdomen, oblong, composed of lobes, filled with very visible ova, although so flaccid that they probably did not approach to the size which they would have reached in the season of reproduction. A short and straight oviduct was closely connected to the kidney: this part was very different from the long tortuous tubes of the frog and salamander, and approached to the structure of fishes.

**Organs of Secretion.**—The kidneys were small, well supplied with blood-vellies, and situated at the sides of the rectum. The bladder elongated, and not divided as in frogs.

The conclusions drawn by Cuvier from the preceding account are: 1. That the sirens, into whatever state it may pass, is a distinct animal, different in all the details of its organisation from the salamanders and their larvae which we are acquainted with. 2. That it is very certainly not defined to poiks hind feet, and consequently is a biped reptile. 3. There is no reason to suppose that it ever loses its branchiae, since it is found to poiks them at the largelst size to which we know of its reaching, and the unanimous testimony of those, who have seen the animal in its native country, proves that no individual has ever been seen without them. 4. That it essentially different from fishes in its osteological structure, and even in the organisation of the branchiae. 5. That it therefore constitutes a particular genus of batracian reptiles, preferring always the double respiratory organs; and may be considered as a permanent larva of that family.

**Anatomy of the Proteus Anguina.**—This animal was first noticed in the Synopsis Reptilium of Laurenti, in 1768. Scopoli gave a more minute account of it in 1772, in his Annum quintus Hiltor. Nat. p. 75. Naturalists were divided in opinion, whether it should be regarded as a perfect animal, or only as the larva of some reptile. An excellent description of it, both as to its external characters and structure, was published in the Philosophical Transactions for 1781, pt. 2, by Dr. Schreiber of Vienna, in a paper entitled "An historical and anatomical Description of a doubtfully amphibious Animal of Germany, called by Laurenti Proteus Augnusius." Cuvier has since described it in his Recherches fur quelques Reptiles douteux.

The individual examined by Cuvier was 0.25 of a metre in length, and of the size of the little finger; Mr. Schreiber saw one of 0.33, or 13 English inches. The body is slightly compressed, and grooved at the sides, like the fore. The tail is more flattened, and furnished at its edges and end with a fin, which does not reach either above or below farther than the anus. The feet are slender; the knee and elbow being about their middle, and directed as in the salamanders; the fore-feet are terminated by three equal toes without nails, the hind-feet by two only; a combination, which is hitherto unique in the animal kingdom.

The head has some resemblance to that of an eel: the opening of the mouth is of moderate size, and furnished with thin lips. The nostrils are a longitudinal slit on each side, parallel to the side of the upper lip. No eye is perceptible externally; but when the animal is skinned, it is seen under the integuments as a black point, about the thirty-sixth of a line in breadth.

In the depression produced by the muscles at the sides of the cranium are the openings of the branchiae. They are three, covered in some degree by a prominence of the skin, supported by a muscular stratum. The branchiae are three small appendages, of a red-blood colour in the living animal.

The skin is whitish, soft, smooth, and presents some small prominences, when examined with a magnifying glass.

**Ototbiay.**—When the muscles, that swell the cranium externally, are removed, it appears flat, and quite on a level with the face; the latter terminates in a point in front. The middle of the cranium has its sides parallel; the posterior part swells out in the situation of the prominences to which the lower jaw is articulated, which are directed forwards. Behind, the occiput has two lateral erithe for the muscles. The head is articulated with the atlas by two condyles; the under surface of the cranium is very flat.

There is no distinct zygomatic arch, orbit, or temporal fossa.

All round the upper jaw is a row of small pointed and vertical teeth; and in front only a small additional row before the others. The inferior jaw has a single row of teeth. Its two branches are nearly rectilinear, and make an angle of about 45°. It has no ascending branch, and the coronoid processes is inconsiderable. All these parts are well ossified and firm; and, although the futures are still visible, we cannot fail to see that the bones belong to an animal very near the adult flat.

The bony apparatus of the gills is much more firm than in the sirens or axolotl, and somewhat differently composed. The hyoidal branches are slender, and suspended from the sides of the cranium behind the articulation of the lower jaw. The os hyoides is short and thick, and supports behind two pieces equally short and thick, which diverge a little. The first arch of each side, which is the largest, is articulated to the extremity of one of these pieces, and has the two other arches attached to its posterior edge.

There are fifty-five vertebrae: the pelvis is attached to the thirty-third; and the twenty-five following belong to the tail. Six only of thee vertebrae, beginning with the second, support rudiments of ribs, still smaller than those of the salamander and the sirens.

All the vertebrae, excepting the last of the tail, are perfectly ossified: their form is peculiar to this species.

**Organ of Digestion.**—The tongue is short, with little power of motion in front, and supported by the anterior extremity.
REPTILES.

Extremity of the os hyoides. The intesinal canal extends nearly in a straight line through the abdomen. The oesophagus is folded longitudinally; and the stomoch is only a rather larger portion of the canal, not marked by any constriction. There is neither cæcum nor large intestine. An oblong liver, pointed at the two ends, of a blackish-grey colour, with two notches in its left edge, occupies about two-thirds of the length of the animal. A large gall-bladder, attached to the internal surface of the liver, pours the bile into the intestine by a short canal. The pancreas is small and narrow, and attached to the intestine opposite to the gall-bladder. An oblong narrow spleen is attached to the mesentery, and is about one-fourth of the length of the liver. The mesentery is simple, and has the usual vessels. There is no omentum.

The Organs of Circulation are the same as in the sire, except that the branchial veins unite together, to form the descending artery, rather lower down.

Organs of Respiration.—The branches are moved, as in the axolotl, the sire, &c.; but no reptile has so small a proportion of lung as the proteus. There is no larynx, properly so called, only a small opening at the bottom of the pharynx, which is the entrance of a common crescent-shaped cavity, the angles of which are prolonged to form the lungs. The latter are merely two very thin membranous canals, terminated by a slight dilatation, containing in their interior no division into cells, and exhibiting very few blood-vessels on their parieties. When we consider how little difference there is between such lungs and the forked air-blisters of some carthaginian fishes, we can hardly help concluding that there is some analogy between the two organs.

Organs of Generation.—In the female described by Cuvier, oblong lobed ovaries, full of very distinct small ova, were situated towards the lower part of the abdomen, at the sides of the rectum. Very long oviduets, making several turns, like those of the salamander, ascend to the anterior third part of the cavity.

Organs of Secretion.—There are kidneys and a bladder, as in the salamanders; the former are very long, and pass high up in the abdomen. All these observations, and particularly those concerning the osteology, make it clear that the proteus is a particular animal, different from all hitherto known: they also make it very probable that it is an adult animal, not defined to undergo any further change of state.

A proteus taken alive swam up from its stomach many shells of the genus helix, but it would not take these shells or any other food, and became daily more languid and weak. It seemed, when alive, very torpid, and moved but seldom; it swam, however, sometimes, with the help of its broad tail, very swiftly, in every direction. The first days it crept slowly on the bottom, and seemed to look for food; it often took a shell into its mouth, but gave it out again, swallowing none. Several times it rose to the surface, stretched its head out of the water, and took in air, but returned directly to the bottom. It uses its feet in creeping on the bottom, and in ascending along the sides of the vessel, if of wood. It creeps very slowly or deliberately, infomuch that this motion seemed quite characteristic of the animal.

It often produces a hissing kind of noise, pretty loud, more so than one should expect from the size of the animal, and resembling that produced by drawing the pinion of a syringe.

All the habits of the proteus designate a flowtext and weakly text agreeing very well with the excessive smallness of its pulmonary organs, and the very inconsiderable extent of their surface.

It is a very rare animal, having been hitherto found, and that in very small numbers, only in those lakes of Carniola, which are celebrated on account of their subterranean communications and singular phenomena which result from them. That of Cirkinitz is the most famous, and is regarded as the source of all the others. According to Laurent, the first proteus was found in this: but Schreiber affirms us that it only inhabits the lake called Sittichar See, communicating with the Cirkinitz; and that it is thrown out in the overflawings, which occur once or twice a year.

Cuvier thinks it probable that its natural abode is in the subterranean communications extending from one lake to the other. It has, in fact, all the characters of a subterranean, as well as of an aquatic, animal. Its small eyes, concealed and rendered ufeles by an opaque skin, recall to us the blind rat (zemni, mus, or fpalax typhlus) which lives underground, and has exactly the same organization.

In a letter to Cuvier, Schreiber informed him that, since the publication of his paper in 1801, he has met with several individuals, all perfectly alike, among which he had in vain sought for one without the branchiae. That he himself has some, which have been two years in his possession, alive and well, although they have taken no food the whole time.

For the external figure and anatomy of this animal, see the plates subjoined to Dr. Schreiber's paper in the Phil. Trans. and pl. 13 of the Recueil d'Obs. de Zool. et d'Anat. Comparée de Humboldt, v. 1.

Another of these doubtful animals has been figured in the Annales du Museum, v. 10. p. 230. pl. 17. under the name of protea, or salamandra tetradselty, by Lacépède, who has there described its external conformation. It possesses branchial appendages, eyes covered by the epidermis, and two rows of fine teeth. As only the specimen described in the above quoted work is known (without any information about the quarter whence it came), its anatomical structure has not been examined. All the appearances lead us to expect an internal organization like those of the proteus and sire.


Reptiles are likewise used, abusively, for plants which creep on the earth, or on other plants, as wanting strength of stalk to sustain themselves.

Such
REPTON, in Geography, a considerable town in the hundred of Repton-and-Grebley, and county of Derby, England, is situated near the banks of the river Trent, at the distance of eight miles S.W. from the town of Derby, and four N.E. from Burton-upon-Trent in Staffordshire. Among antiquaries it is celebrated as the site of the capital of the Mercian monarchy, and the burial-place of several of its sovereigns. At that period it was called Reepandune, and is conjectured by some to have risen upon the ruins of the Roman station Repandunum; and the town is called Reppendune in ancient deeds.

This abbey was destroyed by the Danes as a priory by Matilda, widow of Ralolph, second Earl of Chester, who bestowed upon the monks the tithes of Repton, and considerable estates in the neighbourhood, besides Bartlow in Essex, and lands at Grantham, in Huntingdonshire. At the dissolution its revenues were estimated at 167l. 18s. 2d. In the original structure were deposited the remains of several of the Mercian kings; as were likewise those of Rynedebard, brother to Sigebert, King of the West Saxons. Some portions of the later buildings are yet in existence, being converted into a school-house and apartments for the master and usher. The school-room, as appears from the windows and other traces, was either the refectory, or the hall, of the priory. It is supported by a row of strong round columns, with pointed arches. At the northern extremity of this room was the dormitory; and on the east side were situated the cloisters, the area of which is now a garden. Adjoining the cloisters stood the church which Fuller, in his "Church History," describes as an elegant and spacious structure, supported in the interior by pillars of alabaster, fragments of which have been occasionally laid open. Foundations of other buildings, besides those mentioned, may still be plainly traced in various directions; and on the site of the prior's lodging is a mansion called Old Trent, built about a century ago, which displays, towards the water, a curious brick tower with an ornamental cornice, part of a former building, erected by Prior Overton in the reign of Henry VI.

Repton consists chiefly of one street of scattered houses, extending about a mile in length, and watered by a fine stream, which discharges itself into the Trent. At the lower end of the town stands the parish church, a large, handsome edifice, ornamented with a fine spire two hundred feet high. Tradition affirms that the present is the third church which has occupied the same site; and there can be no doubt that parts of it are of different and distant dates. The nave and side aisles seem to be of the reign of Edward III. But the chancel is probably more ancient, as its columns are massive, and its arches semicircular. Beneath this part of the church is a crypt, bearing a strong reminiscence, in form and ornaments, to the crypt under Canterbury cathedral, and also to that under St. Peter's in the East, at Oxford. In the interior of this building are several handsome monuments to the memory of the Thacker family. Within a close behind the church, a labourer some years ago discovered a cemetery, which contained among many other human skeletons, one of an extraordinary size, measuring nine feet in length. This discovery is noticed by Dr. Pegge in the Philosophical Transactions for the year 1734. An old stone cross, consisting of a single shaft, placed upon eight octagonal steps, stands in the area fronting the church. The parish of Repton, according to the parliamentary returns of 1811, contains 326 houses, and 1638 inhabitants, who are chiefly engaged in pursuits connected with agriculture.

At a short distance from Repton is Sudbury, the seat and property of the family of Vernon, which is of great antiquity, deriving its descent from Richard de Vernon, a Norman lord, who accompanied the Conqueror to England; and was one of the seven barons created by Hugh Lupus, the great Earl of Chester. Sir Ralph de Vernon, who was alive in the reign of Edward II., is said to have reached the extraordinary age of 150 years. Sudbury church, an ancient fabric, standing in the garden near the house, is decorated with many sepulchral tombs to members of this family. One, in commemoration of Catherine, daughter to the late Lord Vernon, is remarkable for the beauty of the epitaph, which was written by William Whitehead, poet-laureate.

At Egginton, on the banks of the river Dove, west of Repton, is a seat of Sir Henry Everly, whose family was originally seated in Somersetshire. Part of the old mansion here was destroyed by fire in the year 1736, and the present house then erected on its site.

Brently park, the seat of the earl of Chesterfield, is about three miles S.W. of Repton. About three miles E. of Brently is Calke hall, the seat of Sir Henry Harpur, bart. The house is a spacious quadrangular edifice, seated in a park surrounded by eminences. Beauty of England and Wales, vol. iii. by John Britton and E. W. Brayley, 1802.